



The Source Code: Revenue Composition and the Adequacy, Equity, and Stability of K-12 School Spending

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April 2023



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EXECUTIVE SUMMARY

School finance debates frequently turn on two crucial questions: How much do state and local governments spend on K-12 education? How are education dollars distributed across jurisdictions? This focus makes sense because the answers to these questions determine how well states are able to provide an adequate, equal education for all students.

This report, however, focuses on two different questions: (1) Where do school revenues come from? and (2) How does revenue composition affect education policymaking? Put differently, this report focuses on the degree to which states rely on state versus local revenue, or on different types of taxes (e.g., those on income, sales, or property), and how such features matter for the adequacy and equity of education spending.

Two states with identical finance systems and student populations, and which spend the same amount overall on K-12 schools, might have very different adequacy and equity outcomes depending on the composition of their revenue. In short, money matters; but where money comes from matters too.

WHY REVENUE COMPOSITION MATTERS

When revenue composition is mentioned at all, it's often the statistic that, nationally, about 45 percent of K-12 revenue comes from state sources, about 45 percent from local sources, and around 10 percent from federal sources. Yet in many states this breakdown does not resemble the national situation: State shares vary from approximately 30 to 90 percent while local shares range from nearly nothing to around 65 percent.

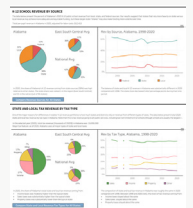
These compositional differences may matter for policymaking because different types of state and local revenue tend to be distributed differently to public

school districts. In general, local revenue, mostly from property taxes, stays in the jurisdiction where it is raised, with wealthier districts able to raise far more for their schools than their less affluent counterparts (and to raise the same amount at lower tax rates). In contrast, state revenue, which is mostly from income and sales taxes, is typically “pooled” statewide and then distributed based on district need and capacity, with higher-poverty districts receiving more.

As a result of these tendencies, there are often proposals to eliminate local property taxes as a source of school funding, and replace it with state revenue. This, proponents claim, would improve the adequacy and equity of K-12 finance systems, because state revenue, unlike most local revenue, is targeted based on factors such as poverty, wealth, and special-needs student populations.

This report is accompanied by an online data visualization tool, which allows you view your state's “revenue portfolio” and compare it with that in other states.

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These proposals presuppose (with reason) that relying more on state over local revenue will improve adequacy/equity, but there are very few multistate or national studies confirming or denying this. And it is far from a sure thing. If, for instance, states that rely more heavily on state revenue also tend to be those that target those funds less effectively by district need/capacity, or if districts in these states have more freedom to increase local revenue to meet their needs, these factors could mitigate or even nullify the adequacy/equity impact of larger state revenue “shares.”

Revenue composition is also an important focus because adequacy/equity are not the only outcomes that matter to education policymakers. In addition, revenue stability (or volatility) affects how well states are able to provide an adequate education to all children. If revenue is unpredictable, states and districts continually face budget shortfalls, preventing them from planning effectively in both the short and long term.

Unfortunately, as we show below, a greater reliance on state revenue (which draws from income and sales taxes) exposes districts to increased volatility of funding. Because high-poverty districts rely on state aid more, they face greater risk of revenue volatility. Put differently, the revenue composition that enables higher levels of equity/adequacy (relying on state aid) may also create year-to-year budgeting dilemmas for low-income districts.

Accordingly, in this report, we carry out a national examination of the relationship between revenue composition and K-12 school funding adequacy, equity, and volatility/stability. Our analysis, to our knowledge, is the first to explore composition's association with student outcome-based adequacy and equity measures that are comparable across all states, and among the first to examine the role of composition in shaping funding volatility/stability. Using descriptive analyses and a set of regression models designed for panel data, we address three general research questions (which can also be interpreted as hypotheses) using data between 1998 and 2020:

1. Do states that rely more heavily on state revenue exhibit more adequate K-12 spending statewide?
2. Do states that rely more heavily on state revenue exhibit more equitable K-12 spending (i.e., more equal educational opportunity)?
3. Do states that rely more heavily on state revenue experience more volatile K-12 spending?

Our research design, as well as the complexity and heterogeneity of state school finance systems, precludes our drawing any strong conclusions about the *causal* effect of K-12 revenue composition on adequacy, equity, or stability/volatility. Our primary goal, rather, is to explore these relationships and provide policymakers with some sensible recommendations about how to balance their education revenue “portfolios” in a manner that might contribute not only

to increased distributional fairness, but also to more rational planning and hiring.

RESULTS

First, we find some evidence that a state that makes a shift to rely more on state revenue is likely to see gains in adequacy. Put differently, when the state share of revenue increases within states over time, funding tends to become more adequate—i.e., a larger proportion of states' students attend school districts that spend at or above estimated adequate levels. Despite this, when we looked across states, we found that this reliance on state revenue is not associated with higher levels of adequacy (increases in state shares may improve adequacy over time even though states with larger state shares don't exhibit more adequate funding).

Second, turning to the connection between revenue composition and equity (or equal opportunity, defined as the gap in adequacy between the highest- and lowest-poverty districts in each state), we reveal that a state that shifts to rely more on state revenue does not consistently see a corresponding shift in equity (the relationship is positive but not statistically significant). In contrast, however, our cross-state analysis revealed that states that rely more heavily on state revenue for their schools do tend to exhibit more equitable K-12 funding.

We interpret the results of both sets of models as tentative evidence of the potential adequacy and equity benefits of ensuring that a healthy share of K-12 funding comes from state sources (typically income and sales taxes), as state revenue is typically pooled and targeted according to district need and capacity.

Greater reliance on state revenue, however, is not without its risks. And so, third, as expected, our models that focused on the connection between composition and spending volatility/stability suggest greater reliance on state revenue (versus local revenue) is associated with more volatile K-12 funding. In other words, where state shares are higher, K-12 revenue tends to jump and dip year to year more severely than it does in states where state shares are lower. This, we suggest, is because the taxes that constitute most state revenue (those on income and sales, particularly the former) are more volatile than the property taxes that feed local coffers.

In summary, our results indicate that greater reliance on state revenue as a share of total K-12 revenue may represent a trade-off—i.e., it may improve adequacy and equity but foster greater volatility of resources over time (and all the hardships that such volatility entails).

POLICY RECOMMENDATIONS

Based on these findings, our first and most general recommendation is for states to maintain at least a somewhat balanced portfolio of revenue by source (state/local) to support public elementary and secondary education. We cannot say what the “optimal shares” might be, and even if we could, they would vary by state characteristics (e.g., student populations, economies, etc.). We can, however, recommend that states maintain a meaningful share (approximately one-third or more) of revenue from local sources, as doing so will provide protection against volatility and its consequences. And this may require rolling back or eliminating policies that cap or otherwise constrain state and/or local revenue growth, as these policies can limit the flexibility to calibrate revenue portfolios, both generally and year by year, in response to economic conditions.

At the very least, our findings lend themselves to implications as to what *not* to do—i.e., **we would caution against any attempt at complete or near complete replacement of local revenue with state revenue without a careful examination of its implications in terms of volatility.**

To be clear, state revenue is the great equalizer in school finance, and adequacy and especially equity are the primary goals of state school finance systems. States should rely heavily on state revenue (and target it at districts that need it most). Yet proposals to replace property taxes entirely with state income and/or sales taxes, while typically well-meaning and correct in their focus on equity, may be addressing a problem (inadequacy/inequity) but exacerbating another (volatility) that is also of particular concern to higher-poverty districts, which already face challenges (e.g., recruiting and retaining teachers) that may be worsened by more volatile funding, particularly during economic downturns.

Recommending that states, if necessary, recalibrate their revenue portfolios is one thing, but actually

accomplishing this goal is complicated (even putting aside the fact that few policy areas are as politically explosive as taxes). Concrete recommendations of beneficial approaches to calibrate revenue portfolios are somewhat elusive precisely because there is a trade-off between adequacy/equity and stability. Ideal policies may be those that “crack the code” of this trade-off by drawing on the strengths of state and local revenue. Toward this end, it bears mentioning that the relationships we find in our analysis are not the result of any inherent features of different taxes but rather how they are typically collected and distributed (e.g., state revenue is pooled and distributed based on need while local revenue “stays home”). Thinking outside these proverbial boxes can yield real benefits.

We therefore recommend that states **consider policies to redistribute stability (e.g., state taxation of commercial/industrial property) and/or stabilize redistribution (e.g., expanding the state sales tax base in a progressive or progressivity-neutral manner).** The key here is not changing the type of taxes levied but rather who collects them or what is taxed.

The idea of state taxation of nonresidential property has existed in the academic literature for over 40 years but has never really been tried at scale. The approach here is that the state, rather than localities, taxes nonresidential (e.g., commercial and industrial) property, generating state property tax revenue that is more stable than that from sales and especially income taxes, but can also be pooled and distributed the same way as other state revenue (based on district need and capacity). In other words, this policy maintains the adequacy/equity benefits of state revenue while reducing the downside (volatility). Our results, including our supplemental analysis of the property tax bases in California, Connecticut, and Texas, suggest that this type of policy, coupled with well-designed state aid formulas, could shift as much as 20 percent of all K-12 funding from inequitably- to equitably-distributed property tax revenue.

Conversely, instead of “redistributing stability” by “moving” a tax base between governmental levels (in this case, from local to state), states might “stabilize redistribution” by changing the composition of state revenue to rely more on sources that are more stable. In other words, instead of changing the entity levying taxes, change the tax base. Specifically, we

suggest states consider ways to rely more heavily on progressive sales taxes (or, even more effectively, to expand the sales tax base in a “progressivity-neutral” manner).

For example, most states levy sales taxes on only a fraction of the services that they can, with such services including everything from haircuts to lawncare to investment counseling and country club mem-

berships. Taxing more of these services (with special priority on those more commonly used by higher earners), while also increasing income tax credits for low-income households, could potentially increase the share of state revenue from sales taxes (which are more stable than income taxes but no less equitable in terms of how they are distributed to schools) without the deal breaker side effect of making state taxation more regressive (or less progressive).

Note that the point of our specific policy recommendations is not to interpret the potential connection between composition and K-12 funding adequacy, equity, and volatility as an invitation to turn taxation and school finance on its head by reversing fundamental features of systems that have developed over many decades. We are mindful that the composition of K-12 revenue is in many respects something that “just happens” rather than an outcome that is planned directly. We also acknowledge that even small changes to these systems often require massive efforts on the part of legislators, advocates, parents, educators, and other stakeholders.

Our point, rather, is that there may be unconventional but possibly realistic approaches to revenue composition-focused reform that exploit this trade-off between adequacy/equity and volatility, and that these approaches might confer substantial benefits without requiring an aggregate increase in spending. At the very least, the most general implication of our findings is that revenue composition may be an important factor mediating the outcomes of states’ school finance systems, and it deserves more attention in our debate about the performance of these systems and how to improve them.

INTRODUCTION

Over the past decade, a consensus has emerged regarding schools, money, and state school finance systems. In short, analysts, scholars, and policy-makers agree that money matters. This consensus is anchored by a growing body of high-quality empirical research showing that equitable, adequate financing is necessary for providing high-quality schooling to all children (Baker 2017, 2018; Candelaria and Shores 2019; Jackson 2020; Jackson, Johnson, and Persico 2016; Jackson, Wigger, and Xiong 2021; Jackson and Mackevicius 2023; Lafortune, Rothstein, and Schanzenbach 2018). As such, the primary job of state education financing is to provide all students, regardless of their background, with the resources they need to achieve common outcome goals.

While this is an important and necessary focus for policymakers, the *composition* of K-12 revenue—e.g., the degree to which states rely on state versus local revenue, or on different types of taxes—has received far less attention (for a recent exception, see Kenyon, Paquin, and Reschovsky [2022]). As a result, we have relatively little understanding about how composition is related to the equity goals pushed for by activists and policymakers.

This report's contribution is to help address this shortcoming. We argue that composition matters, first, because different types of revenue tend to be distributed differently. In general, local revenue, mostly from property taxes, stays in or near the jurisdiction in which it is raised. As such, wealthier districts are able to raise far more than their lower-income counterparts, or to raise the same amount at lower tax rates. State revenue, meanwhile, mostly from income and sales taxes, is typically pooled statewide and then distributed based on district need and capacity.

A second reason that composition matters, we argue, is because different sources and types of revenue are differently stable (or volatile) over time. As a rule, state revenue, particularly that from income taxes, tends to fluctuate quite a bit based on economic conditions (e.g., recessions), whereas local (mostly property tax) revenue is more stable (Cornia and Nelson 2010; Seegert 2016).

Stability is important because, for instance, year-to-year uncertainty regarding available resources can complicate budgeting processes and decisions such as hiring even under “normal” economic conditions, while severe economic downturns can create catastrophic shortfalls in funding. Whether revenue composition causes such volatility is also an empirical question, but an important one, as it might be leveraged to address these problems, which, incidentally, disproportionately affect higher-poverty districts (as they rely more heavily on state revenue). It follows, then, that any evaluation of revenue composition's influence must account for its potential impact on stability/volatility as well as adequacy/equity.

In this report, we elaborate these arguments by carrying out a national examination of the relationship between revenue composition and K-12 school funding adequacy, equity, and volatility/stability. Our analysis, to our knowledge, is the first to explore composition's association with student outcome-based adequacy and equity measures that are comparable across all states, and among the first to examine the role of composition in shaping funding volatility/stability. Our primary goal is to provide policymakers with recommendations about how to balance their education revenue “portfolios” in a manner that increases distributional fairness while, simultaneously, allowing for a more rational planning and teacher hiring process.

REVENUE COMPOSITION AND SCHOOL FUNDING

The journey of tax revenue to classrooms is long and complicated. Every year, hundreds of billions of dollars in public funds are distributed based on 51 different configurations of formulas, rules, and regulations to thousands of districts that vary dramati-

cally in terms of the students they serve, their ability to raise revenue locally, and many other factors. In most states, only a handful of insiders fully understand the intricate details of their systems.

Thus, before diving into our analysis, this section provides a quick overview of how K-12 revenue sources work, how revenue composition might (or might not) influence the adequacy, equity, and stability of school funding, and a few relevant issues surrounding local tax reform. Finally, this section ends with an articulation of our primary research questions, which will guide the analysis presented below.

REVENUE SOURCES AND FLOWS

In this report, we refer to **revenue sources** as the governmental level from which revenue originates. All K-12 revenue comes from three revenue sources: the federal, state, and local governments. Our analysis is primarily focused on assessing the implications of greater or lesser reliance on state and local revenue. On average, more than 90 percent of school district revenue comes from state and local sources; the rest comes from the federal government.¹

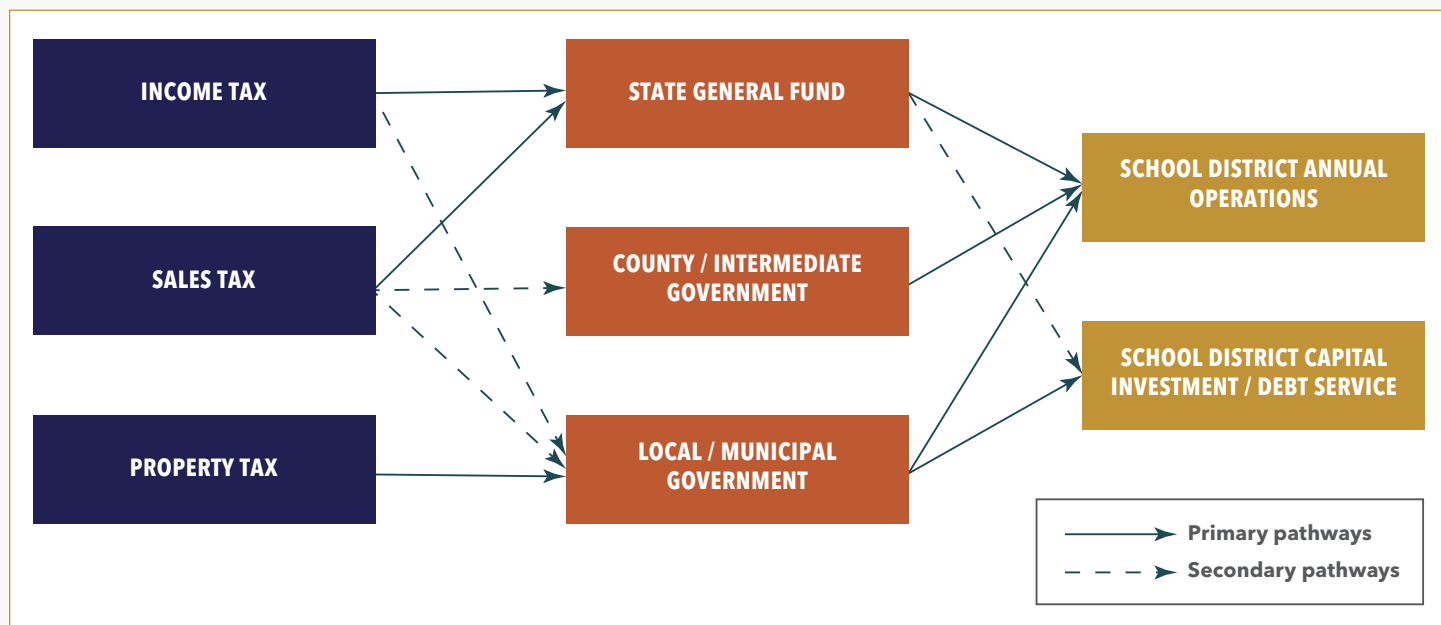
Revenues also vary in terms of the type of tax from which they are drawn. In the United States, school funding formulas rely on three primary **revenue types** (or **tax types**): property taxes, individual income taxes, and sales taxes. Most local revenue for schools comes in the form of property taxes, whereas state revenue is largely a combination of sales and income taxes.

Figure 1 summarizes, in general terms, how the three major revenue sources, and the three primary state and local tax types, flow through government levels and eventually to districts. The solid lines in the figure represent primary, more common pathways; the dashed lines are secondary, less common pathways.

On average, districts receive about 45 percent of their revenue from their local/municipal jurisdictions (or intermediate jurisdictions such as counties), about 47 percent from the state, and the remaining 8 percent from the federal government (Cornman et al. 2022). Most of this total revenue (about 85 percent, on aver-

FIGURE 1

Conceptual diagram of K-12 revenue flow



¹ To date, much of the federal aid has been allocated on the basis of child poverty concentrations through the Title I program (or to districts with larger populations of special education students). As a result, larger slices of federal aid do tend to go to districts with both greater needs and costs and less local capacity of their own.

age) ends up being spent directly on instruction (e.g., teacher salaries) and support services (e.g., transportation, administration, etc.). The bulk of the rest (about 10 percent of the total, on average) goes toward capital spending (e.g., construction), while the remaining 4-5 percent is spent on other services (e.g., adult education) or to pay down debt. These proportions vary by state, but note, first, that not all revenue is spent “directly” on schools (e.g., some revenue goes to capital investment and debt). In our analysis, we measure revenue composition including all revenue, but the primary outcomes of interest focus on the funds spent “directly.”

Second, as this figure shows, the types of taxes that constitute state and local revenue sources are not set in stone. Theoretically, states, rather than localities, could collect most property tax revenue and distribute it through the general fund, while local jurisdictions such as counties can (and do) levy sales and income taxes. And, as we’ll discuss, some states choose not to collect income and/or sales taxes at all.

That said, while there is some interstate variation, there are typical patterns in revenue types and sources, which are represented by the solid arrows in Figure 1. Specifically, local governments rely most heavily on property taxes to generate revenue, whereas most state revenue comes from a mix of income and sales taxes (but, again, the balance varies widely by state).

REVENUE COMPOSITION AND FUNDING ADEQUACY/EQUITY

Understanding how K-12 revenue composition might affect the adequacy and equity of K-12 spending requires some understanding of how the revenue flows shown in Figure 1 take their final steps to districts and schools—or, at least, how that process should look. Local jurisdictions (henceforth “districts” for simplicity) differ in two important ways. First, they differ in terms of how much funding they require to achieve a given level of educational quality—i.e., they differ in terms of *costs*. Costs vary because student populations vary (e.g., some districts serve larger shares of disadvantaged students than others) and also because the economic and social characteristics of school districts vary (e.g., some districts are located in labor markets with higher costs of living than others) (Duncombe and Yinger 2005). Second,

jurisdictions differ in their capacity to raise revenues (mostly through property taxes), which results in higher tax rates for communities with lower property wealth, and less potential to raise revenue at a given tax rate.

These two factors—district costs and local revenue-raising capacity—are strongly (but not perfectly), negatively associated with each other. Districts with less local taxable wealth are also far more likely to serve higher concentrations of students in poverty, and child poverty is a major factor determining the cost of providing children with equal opportunity to achieve common outcome goals (Duncombe and Yinger 1998, 2000, 2005; Imazeki and Reschovsky 2004; Reschovsky and Imazeki 2000). For example, high-poverty districts often have to offer higher salaries to recruit and retain teachers (Hanushek, Kain, and Rivkin 2004; Lankford, Loeb, and Wyckoff 2002), while smaller classes have been shown to narrow outcome gaps between students from different backgrounds (Dynarski, Hyman, and Schanzenbach 2013; Konstantopoulos and Chung 2009).

As a result, states frequently (and rightfully) face questions and criticisms about the equity or adequacy of their education spending. In effect, these debates (and litigation) often focus on whether states are ensuring that students in poorer districts are funded at levels that are adequate for them to achieve common outcomes (Moser and Rubenstein 2002). As might be expected, one of the many issues of contention in these debates (and court cases) is the definition of terms such as “adequacy” or “equity.” In Box 1, we present our conceptual definitions of both terms; we also define and measure these concepts in greater detail below.

In the meantime, it is important to recognize that many state courts, in response to concerns about adequacy/equity, have reaffirmed that their constitutions mandate statewide school funding systems that take student poverty and equal opportunity into account (Rebell 2009). That is, they essentially require states to make up the gaps (with state aid) between districts’ needs/costs and their ability to pay those costs with local revenue.

Based on this widely accepted conceptualization, then, an ideal state school finance system would look something like that depicted in Figure 2. In this

BOX 1

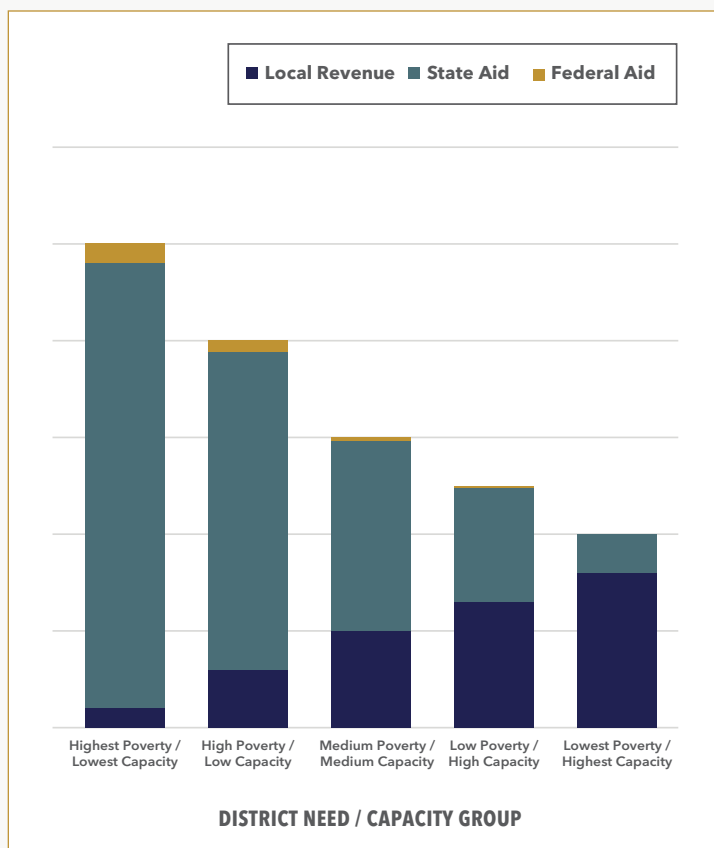
Defining concepts: Adequacy and equity (equal educational opportunity)

Adequacy and equity are sometimes defined differently by different people. We define these terms, both conceptually and methodologically (discussed in more detail in the next section), as follows:

Adequacy measures whether districts spend at or above target (adequate) levels, with those targets identified as the minimum funding levels needed to achieve particular student outcome goals, such as national average test scores. Under this approach, for example, District A might spend 50 percent above the estimated adequate level, and District B might spend 5 percent above that target, but both districts would be categorized as “adequately” funded (to achieve a given common outcome goal, which may be high or low).

Equity (or equal educational opportunity) compares adequacy between the highest- and lowest-poverty districts within a state. For example, State A might spend, on average, 30 percent above estimated adequate levels in its lowest-poverty districts and 5 percent above adequate in its highest-poverty districts (a gap of 25 percentage points), while State B might spend 30 percent above adequate in its lowest-poverty districts but 10 percent below adequate in its highest-poverty districts (a 40-point gap). In this case, both states’ funding would be inequitable, but State B’s funding would be more inequitable (or exhibit more unequal opportunity) than State A’s, since there is a larger discrepancy in adequacy between the highest- and lowest-poverty districts in State B than there is in State A. Note that, under this approach, equity/equal opportunity do not depend on how or where one sets the adequacy “bar.” Funding in the highest- and lowest-poverty districts can, on average, both come in above the adequacy line (as in State A), or one above and the other below (as in State B), or both below; the key is comparing how far the highest- and lowest-poverty districts are from each other. Throughout this report, we use the terms “equity” and “equal opportunity” interchangeably.

FIGURE 2

Hypothetical adequate and equitable state school finance system

graph, districts are sorted into five groups (the five bars on the horizontal axis), with the highest-poverty, lowest-capacity districts represented by the leftmost bar and the most affluent, highest-capacity districts all the way to the right (“capacity” here refers to the capacity to raise revenue locally). The total length of the bars for each district group represents the costs of achieving a common student outcome, such as a given average test score. In other words, for the sake of this illustration, the lengths of the bars are both target adequate funding amounts as well as actual funding amounts.

There are two key features of Figure 2. The first is that total costs (the length of the bars) are higher for the higher-poverty districts than for the lower-poverty districts (the bars slope downward from left to right). This, again, is due to the former serving larger shares of high-need students, which, all else being equal, drives up costs. Second, in this (hypothetical) state, as in virtually all states, the highest-poverty districts are able to raise much less local revenue per pupil (the dark blue portions of the bars) than their more affluent counterparts, and the difference between this local revenue and total costs is made up by state revenue (the teal portions of the bars), with some help from federal aid (the gold portions). In short, the total length of the bars and the amount of blue vs. teal area in each bar will vary widely between

(and within) states, but the key idea is that state aid ideally fills the gap between local capacity and costs, so that all districts have what they need given the students they serve.

Most state school finance systems do not resemble the ideal system in Figure 2. Even when districts' (adequate) funding targets are determined rigorously, which is the exception rather than the rule, rarely do states actually target sufficient state aid to the highest-need and lowest-capacity districts to achieve funding adequacy. Conversely, many affluent districts that are able to raise copious revenue locally also receive a cut of state aid they don't actually need in order to achieve adequate spending. As a result, it is extremely common for the most affluent districts in a given state to receive far more adequate funding than the higher-poverty districts in that state. In fact, such unequal opportunity gaps exist in every state, though their magnitudes vary widely (Baker, Di Carlo, and Weber 2022).

That said, it is clear that state education aid—with some help from federal funds—plays the role of equalizer (or at least partial equalizer). State revenue is usually pooled and redistributed so that it compensates, at least to some degree, for both the higher costs and lower revenue-raising capacity in higher-poverty districts. Local revenue, in contrast, is primarily drawn from property taxes, and these funds generally stay where they are raised.

From this perspective, states that rely more heavily on state revenue (versus local revenue) may have greater ability to target funds based on costs/capacity, and may therefore be able to achieve more adequate funding overall. And they may be similarly well-positioned to provide more equitable funding (i.e., ensure more equal educational opportunity), as they have more “pooled” revenue to distribute to their higher-poverty districts and close adequacy gaps between rich and poor districts.

For example, a state that raises most of its revenue from state sources will have a larger pool of funds to hand out to districts based on how much each needs to provide its students with an adequate education (minus a “fair share” local contribution based on that district's wealth). In contrast, a state in which most revenue is from local sources (mostly property taxes) is essentially more constrained. It has less opportuni-

ty to redistribute revenue and fill gaps where needed, as local funds generally stay where they are raised. Each district in this latter state will raise a certain amount locally, but the state will have a smaller pool of funds to distribute to fill the gaps between the local revenue and target adequate funding amounts. This state, even if it targets effectively based on need and capacity, is more likely to end up in a situation where state funds are insufficient to fill all the gaps (i.e., lower adequacy), and such gaps are far more likely to be in higher-poverty districts (i.e., more unequal opportunity).

Put differently, two states that serve the same student populations and have a similar funding formula might have very different adequacy and equity results if one relies heavily on state revenue and the other on local revenue. Therefore, we might reasonably anticipate that larger state revenue “shares” should be associated with more adequate and equitable K-12 funding.

On the other hand, the idea that larger state versus local revenue shares will foster adequacy and equity is far from guaranteed (thus motivating our analysis). For one thing, not all state revenue is targeted by district need (Baker and Corcoran 2012), and if this “misalignment” is more common in states with larger state revenue shares, the connection may be partially severed. In other words, if states in which state revenue makes up a large share of revenue also tend to target funds poorly by district need/costs, or if they tend to be those in which state funding is relatively low (in dollar terms, while large in share), a larger (or increasing) state share may not be associated with more adequacy or equity.

It is also important to bear in mind that we are looking at variation in *shares* of revenues, not amounts. Changes in the share of one revenue source can of course stem from an increase in revenue from that source, but the shares can also shift in response to changes in the amount of revenue from *other* sources (including federal aid). If, for example, federal or local revenue increases, the state share may decrease even if state revenue remains relatively flat, and the impact of that shift on funding adequacy/equity may not be as expected (Gordon 2004).

Composition may also have a different effect on adequacy than on equity (or may affect one but not

the other). For instance, as we'll see, states such as Connecticut, Massachusetts, and New Jersey rely comparatively heavily on local revenue to fund their schools (lower state shares), which is due to a combination of high property tax rates, large property tax bases, and the long history of public school funding in the Northeast. This local revenue may help to push a lot of middle-income districts over the adequacy line (higher adequacy), but it also tends to create huge adequacy gaps by district poverty (high inequity, or more unequal opportunity). In fact, the states in which statewide adequacy is highest also tend to be those in which equity is lowest (Baker, Di Carlo, and Weber 2022).

Our analysis also takes a brief look at the relationship between adequacy/equity and composition defined in terms of tax type (i.e., specifically sales versus income tax). Since, as discussed above, state tax revenue is typically pooled and distributed, there is no strong reason to believe that the types of taxes constituting that pool would affect K-12 funding adequacy/equity. So long as the pools of state funds are distributed in a certain way, where they come from shouldn't matter.

On the other hand, income tax revenue, as discussed below, is the most volatile type of revenue, and if we're looking at how composition and adequacy/equity change over time within states (which we are), then income tax share may be an important factor. If, for example, states that rely heavily on income taxes experience larger year-to-year jumps and dips in their revenue compared with states that depend more on other types of state taxes, then the former states might have a harder time maintaining adequate funding streams (in this report, we also directly test this proposition that larger state shares in general are associated with greater volatility).

In addition, income taxes are progressive, whereas sales taxes are regressive—that is, higher earners pay a larger share of their income in income taxes than do lower earners, while a larger share of lower earners' incomes go to sales taxes versus that of higher earners (Wiehe et al. 2018). If more reliance on income versus sales taxes is associated with better adequacy/equity outcomes, then this is worth exploring further. It would be a win-win in that income taxes would

simultaneously improve spending equity and adequacy for children as well as equity for taxpayers. Such a proposal, however, might carry the potential downside of greater volatility, a topic to which we now turn.

REVENUE COMPOSITION AND THE VOLATILITY/STABILITY OF FUNDING

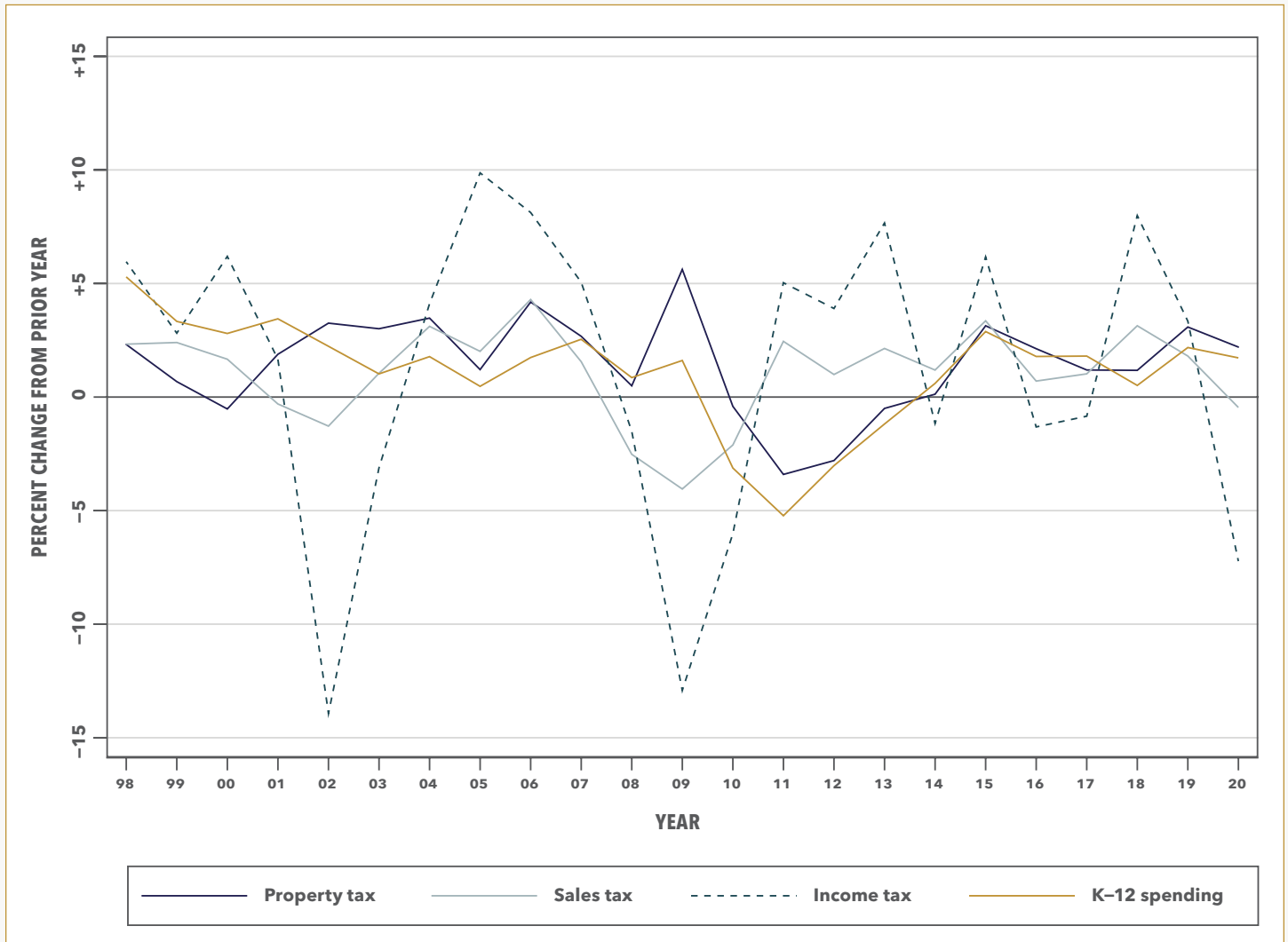
The adequacy and equity of K-12 funding are obvious and justified foci for scholars and policymakers. They are the priority. Yet the volatility/stability of school revenue sources, though it receives far less attention, is also an important consideration (both generally and in the context of revenue composition), as well as one that is in many respects inextricably tied to funding adequacy and equity. It is generally well-established that different sources and types of revenue vary in terms of how stable (or volatile) they are over time, and that tax and revenue portfolios shape stability (Chapman 2008; Cornia and Nelson 2010; Garrett 2009; Kenyon et al. 2022; McNichol 2013; Tannenwald 2002). Whether the composition of K-12 revenue translates into greater volatility of education spending is the second major focus of our analysis.

Figure 3 summarizes the year-to-year change in per-capita revenue (adjusted to 2020 dollars) by tax type (this is total revenue for all services, including but not limited to schools)—as well as the trend in current K-12 expenditures (per capita)—between 1998 and 2020. The year-to-year changes are expressed as percentage changes from the previous year, with a value of 0 indicating no change between years. These data are from the U.S. Census Bureau (U.S. Census Bureau 2022b, 2022a).

Clearly, income taxes (the dashed trend line) are the most volatile throughout this time period, including massive declines and recoveries during and after the two 2000s recessions (the former being right at the beginning of the decade and the latter being the so-called Great Recession of 2007-09). Sales and property taxes are substantially more stable in comparison, as is direct K-12 spending, which is typically the largest category upon which these revenues are spent.²

² To date, much of the federal aid has been allocated on the basis of child poverty concentrations through the Title I program (or to districts with larger populations of special education students). As a result, larger slices of federal aid do tend to go to districts with both greater needs and costs and less local capacity of their own.

FIGURE 3
National revenue and spending volatility, 1998-2020
 Year-to-year changes in state and local tax revenue (by tax type) and direct K-12 spending, 1998-2020



Note: Income, sales, and property tax estimates include all state and local revenue from these types, including but not limited to K-12 education revenue. Amounts adjusted to 2020 dollars.

DATA SOURCE: U.S. CENSUS BUREAU



Revenues (and K-12 spending) fluctuate a bit in virtually all years, but one big driver of volatility is major changes in overall economic conditions, such as recessions. Over the past three decades, the United States has experienced four very different economic downturns, the latest of which (the COVID-19 pandemic-induced downturn) we have yet to fully digest and review historically, as full data are not yet

available).³ The early 2000s recession had its strongest effect on incomes and income tax revenues (as did its early 1990s predecessor, which is not shown). The massive 2007-09 recession, the effects of which are in many respects still evident in school funding today (Leachman, Masterson, and Figueroa 2017), was unique in both magnitude and characteristics. This recession was brought on in part by the collapse

³ The decline in sales and especially income tax revenue between 2019 and 2020 likely reflects the pandemic’s earliest months, yet the impact on school spending typically takes a bit more time to “catch up.” When sufficient retrospective data become available, we expect that the pandemic-induced recession will reveal its own unique patterns. The decline in income tax revenues may be less severe than expected given that many high earners transitioned to working remotely. Shifts in property values were likely uneven, but, at least in outlying suburban areas, a new housing price boom was spurred by the pandemic. High density urban housing, however, likely suffered losses. Sales tax revenues may have taken the largest hit, as the retail, travel, tourism, and hospitality industries suffered massive losses, shutdowns, and temporary closures. Again, though, how all this ended up affected schools’ bottom lines (which, by the way, were once again partially buttressed by new federal funds), remains to be seen.

of the housing bubble, so for the first time in recent history, property tax revenues also took a substantial hit (the dark blue line in Figure 3 dipped far below the horizontal 0 line, indicating large and sustained year-to-year declines). But, even then, income tax revenues took a larger, deeper, and earlier hit while sales tax revenues declined similarly to those from property taxes.

Overall, though, the impact on income, sales, and property tax revenues varies by downturn, but income taxes are consistently the most volatile tax type, property tax the least volatile, and sales tax somewhere in between. Obviously, not all volatility is “bad” in the sense of being harmful. Consistent and large year-to-year increases in revenue, for example, technically represent volatility. But the trend in Figure 3 clearly shows that revenue trends are cyclical, with relatively large increases typically flanked by relatively large decreases.

It follows, then, that revenue composition—particularly the balance of state versus local revenue (i.e., composition by source)—may carry serious implications for the stability (or lack thereof) of K-12 spending. Specifically, since income and sales taxes are both more volatile than local property taxes, states that are more dependent on state revenue may experience greater volatility.

This volatility can create major problems for education policymakers and leaders at the state and district levels, and this is an issue that has not received its due attention in the literature in school finance and education policy. And these effects are not limited to the severe cuts that often occur due to major recessions and downturns, such as the 2007-09 recession.

For instance, there is ample empirical evidence suggesting that high-poverty (more state aid-dependent) districts are seemingly inefficient in their budget planning, particularly around their human resource and personnel processes (Liu and Johnson 2006). They often fill teaching vacancies late in the game, in a rushed manner, and when less qualified candidates remain on the job market (Sorensen and Ladd 2020). This apparent dysfunction, which is far rarer in affluent districts, is often blamed on poor or incompetent management, but it is entirely possible that revenue volatility is a major or even the primary factor. Similarly, such unpredictability may help

explain why higher-poverty districts seem to have more trouble recruiting and retaining good teachers (Hanushek et al. 2004).

School districts need predictable annual expenditure budgets to pay for teachers, support staff, and administration. Those expenditures are built on a foundation of revenues from different sources and of different types, each with different degrees of stability. If that foundation consists primarily of state revenue, particularly state income tax revenue, it is analogous to a foundation of sand, one that can threaten the stability of the budgetary structure sitting on top of it.

In addition, insofar as higher-poverty districts rely more heavily than affluent districts on state revenue, the foundations will be shakier in the former. Put simply, when 60-80 percent of a district’s funding comes from the most volatile sources (state income and sales taxes), it is in a much more precarious situation than its counterparts receiving 10-20 percent from these sources. Because higher-poverty districts rely more on state aid than do lower-poverty districts, any volatility will affect the former more acutely than it will the latter *within* any given state.

More important for our purposes here, the same comparisons might be made *between* states. For instance, if State A gets more revenue from state versus local sources than does State B, it stands to reason that the typical school district in State A will also rely more on state revenue than a *similar* district in State B. If so, then State A’s heavier reliance on state revenue to fund its schools may be responsible for more volatile school funding than is the case in State B. This volatility will presumably affect higher-poverty districts more acutely than it will lower-poverty districts in both states, but the *overall* volatility (for all districts, regardless of poverty) should, we predict, be higher in State A versus State B. Accordingly, we test our prediction that larger state shares will be associated with more volatile K-12 funding.

The potential influence of revenue composition on stability, however, is compelling on the surface but may not materialize in practice (thus necessitating our test). As with the relationship between revenue composition and adequacy/equity, there are several factors that may mitigate or nullify the influence of revenue composition on spending volatility. If, for example, states that rely more heavily on state

revenue also tend to be those with more untapped (or tappable) property wealth, or which grant districts greater flexibility to increase local revenue in response to economic conditions, then the association between composition and volatility might, for instance, be offset by districts raising local property taxes to fill state revenue shortfalls (or by federal aid, which is higher in some states, mainly poorer states, than in others). Moreover, to reiterate, not all local revenue is property tax revenue, and not all state revenue is from sales and income taxes. If variation in these breakdowns is associated with the state share of revenue, this too could dilute the composition/volatility relationship. We explore these possibilities to produce empirical evidence about the potential influence of revenue composition on stability.

THE PROMISE AND PITFALLS OF LOCAL (PROPERTY) TAX REFORM

As illustrated by the foregoing discussion, the most important general distinction—or policy choice—embedded in our analysis is that between state (mostly income and sales tax) and local (mostly property tax) revenue. And, indeed, most reforms that focus *directly* on changing the composition of school revenue (as opposed to reforms that may affect composition but as an unintended side effect) seek the reduction or even elimination of property taxes as a school funding source. It is therefore worthwhile to discuss briefly a couple of key issues surrounding such proposals, as well as one alternative we will focus on below.

Property taxes are frequently a target because, for one thing, they are generally unpopular (Cabral and Hoxby 2012), and reducing or eliminating property taxes can appeal to both conservative and progressive voters (to the latter based on their regressivity). Various policies capping or limiting property tax revenue are enacted every year in many states (Kenyon et al. 2022).

A substantial body of literature, however, indicates that simply imposing tax and expenditure limits on state and local governments reduces the quality of

public services over time. Specifically pertaining to public schooling, tax and expenditure limits have led to increased pupil-to-teacher ratios (Figlio 1998), reductions to the qualifications of teachers entering the workforce (Figlio and Rueben 2001), and long-term reductions to student outcomes (Downes and Figlio 2007).

One of the plausibly beneficial ways to reduce local property taxes, however, is not simply to decrease them without replacement, but rather to provide more state aid to cover the cost of providing the quality of services desired, and distribute that aid toward balancing out property tax burdens across communities. Most often, the preferred choice of replacement is sales taxes, particularly “sin taxes” on products such as alcohol and tobacco. As noted above, however, sales tax revenues are more volatile than property tax revenues (though less so than income tax revenue). And, on the taxpayer side, sales taxes are even more regressive than property taxes. That said, state sales taxes might still be allocated equitably—that is, pooled and distributed according to district need and capacity. From this perspective, a policy replacing property tax with state sales tax revenue could plausibly improve adequacy and equity in exchange for greater volatility.

Yet, this type of reform also entails serious risks that go beyond increased volatility. In 1993, Michigan attempted a bold experiment: Eliminate property taxes for education, and replace the revenues with a 2 percent increase in the general sales tax, as well as additional selective sales tax increases, such as those on tobacco products. But these sales tax increases quickly proved insufficient to offset the \$6.5 billion revenue gap created by the elimination of the property tax, and a significant portion of the property tax was eventually restored (Addonizio, Kearney, and Prince 1995). While a handful of studies showed positive effects of the policy on short-run spending equity, the longer-term effect has been to significantly reduce education spending in Michigan (Baker 2016). This example, while a single policy in one state, illustrates the serious risks of even well-intentioned policies designed to leverage changes in revenue composition.⁴

⁴ States have also attempted to provide property tax relief with replacement locally by permitting the use of local option sales taxes, which are sales taxes collected and spent locally rather than at the state level. Like local property taxes, local option sales taxes can lead to significant disparities in revenues raised across jurisdictions, exacerbating K-12 revenue inequity (Craft 2002). Interestingly though, inequities in sales-taxing capacity—the capacity of localities to raise sales taxes, or their sales tax bases—fall differently across jurisdictions than do inequities in property tax revenues. Specifically, urban and suburban areas tend to have far greater sales tax capacity than do rural areas. But, within suburban and rural areas, property tax capacity may vary more widely, whether based on residential housing values or the presence of non-residential, commercial, and industrial properties.

State taxation of commercial and industrial property

Replacing property tax revenue with state sales or income tax revenue is one way to leverage compositional changes to reap the equity benefits of state revenue, but it is far from the only approach, and it may not even be the best approach. One of the more promising ideas that has surfaced periodically for decades is to impose *state* taxes on commercial and industrial property. This proposal essentially combines the strengths of state and local revenue: commercial and industrial property tax revenue is relatively stable, and imposing state rather than local taxes on such property means that the revenue can (in theory) be pooled and distributed equitably. The downside, though, is that the distribution of the new state revenue would have to offset the losses of local revenue that would be incurred by major industrial centers, which are often high-poverty areas.

In 2020, for instance, a California ballot initiative proposed to split property tax rolls between commercial/industrial and residential, for the purposes of valuation and tax collections. The ballot initiative would have created statewide taxation, based on market value, of commercial and industrial properties, with revenues distributed first to cover revenue losses from decreases to the state's personal income and corporate taxes, and to counties to cover the cost of implementing the new plan. Sixty percent of the remaining funds would then have been distributed to local governments and special districts and 40 percent to school districts and community colleges. The referendum was only narrowly defeated.

This idea, in the school finance literature, actually dates back to the 1970s, while in the broader literature on property taxation it goes back to the 1960s (Brazer 1961). One of the earliest explicit treatments of this idea was by economist Helen Ladd in 1976, in which she modeled the effects of adopting such a policy in the Boston metropolitan area (Ladd 1976). The policy she examined was similar to California's 2020 proposal, and she found that equity improvements on either the revenue side or taxpayer side depended on the formula for redistributing statewide tax collections (i.e., redistribution had to be progressive).

Revisiting the idea in 1995, Ladd and Harris simulate the effects of this proposal in New York state

(Ladd and Harris 1995). Their findings were similar to those of the Boston study, suggesting that a sufficiently equalizing aid formula was needed to allocate the state property tax revenues to offset revenue losses for major commercial/industrial centers. Brian Brent followed up in 1997 with a proposal for dividing New York state into regions that would share revenue from taxes on nonresidential properties, showing that in a state with the geographic and economic diversity of New York, regional redistribution might mitigate some of the larger shifts in local collections and redistribution (Brent 1999).

In short, then, state taxation of commercial and industrial property has potential to exploit the strengths of state revenue allocation and property tax stability, but realizing such potential requires equitable/progressive allocation of the new revenue. Note, however, that these studies found only modest equity gains because they observed only how those revenues would be redistributed in a few states that had relatively inequitable aid formulas at the time, and not whether that same amount of aid could be distributed more progressively toward the goal of improving equal opportunity and adequacy. Notably, two of the three states examined in the studies discussed above—Massachusetts and New York—exhibited regressive K-12 funding in the mid-1990s, while funding in the third (California) was flat (neither regressive nor progressive).⁵ Moreover, these studies did not focus on the additional (potential) benefit of redistributing volatility impacts—i.e., achieving more stability by splitting property tax rolls—which is an additional key benefit of this policy.

SUMMARY AND RESEARCH QUESTIONS

To reiterate, the primary goal of any K-12 school finance system is to provide all students, regardless of their backgrounds, with an equal opportunity to achieve common outcome goals. Researchers, advocates, and policymakers have paid a great deal of attention to assessing whether states' systems achieve this goal. But one potentially important and frequently overlooked factor is whether and how the *source* of school funding might play a role in mediating these outcomes.

⁵ Authors' calculations using data from the School Finance Indicators Database (Baker, Di Carlo, Weber, et al. 2022b).

In Table 1, we summarize the salient features of and our predictions for the three major types of state and local taxes, which constitute the majority of all state and local K-12 revenue. On the surface, in the context of our analysis, the choice between state and local revenue may represent a trade-off between equity and stability, with greater reliance on state revenue as a share of all revenue offering potential benefits for adequacy/equity and potential costs for stability. That does not, however, necessarily mean that states that rely more heavily on state revenue will exhibit more equitable (or adequate) funding, nor that more local revenue-dependent states will enjoy more stable school funding. State school finance systems are incredibly complex, and numerous factors, some of which are discussed above, might very easily mitigate or counterbalance the impact of revenue composition on these spending outcomes.

The purpose of this report is to provide a deep dive into the relationships between the composition of revenue (by source and type) and the adequacy, equity, and volatility of public school district spending. We focus our efforts on the schools’ side of the equation (i.e., adequacy/equity for school districts in Table 1), with comparatively little emphasis on the taxpayer side (i.e., progressivity for taxpayers), but we emphasize that both must be kept in mind when designing state school finance systems.

Based on the discussion above, our analysis addresses the following three research questions (all of which can also be interpreted as hypotheses):

1. Do states that rely more heavily on state revenue exhibit more adequate K-12 spending statewide?
2. Do states that rely more heavily on state revenue exhibit more equitable K-12 spending (i.e., more equal educational opportunity)?
3. Do states that rely more heavily on state revenue experience more volatile K-12 spending?

These questions focus exclusively on composition by revenue source—i.e., state versus local revenue shares—but we also present some results that disaggregate revenue by type, specifically the share of state and local revenue from income taxes. The bulk of our analysis consists of regression models using data from virtually all U.S. states over a time period that spans more than two decades. We turn now to describing these data and models.

TABLE 1. FEATURES AND PREDICTIONS OF THREE PRIMARY STATE AND LOCAL TAX REVENUE TYPES				
			Predicted impact on K-12 funding	
Tax/tax base	Primary level	Taxpayer progressivity	Adequacy/Equity	Stability
Property	Local	Moderate	Low	High
Sales	State	Low	High	Moderate
Income	State	High	High	Low

DATA AND METHODS

To reiterate, revenue composition is our primary independent variable of interest. Most of our focus is on revenue by source (i.e., how much states rely on state versus local revenue), but we also take a quick look at composition by type (i.e., how much states rely on income versus sales versus property tax revenue). Our analysis examines the connections between revenue composition and two types of outcomes (dependent variables): adequacy and equity (separately); and stability/volatility.

We begin this section by discussing how we measure revenue composition, adequacy, equity (equal opportunity), and stability. Following that, we offer an overview of the methods and models that constitute our analysis.

First, however, we would note that all of our analyses exclude four states and the District of Columbia. Alaska is excluded because it imposes neither state individual income nor state sales taxes, and yet a large proportion of its K-12 revenue comes from state sources (severance taxes on gas and oil production); this is a fundamentally different structure from that in virtually all other states (it is also extremely volatile). We do not include the District of Columbia and Hawaii because both consist of a single government-run school district, and so our focus on the role of revenue composition by source does not really apply (we also don't calculate adequacy/equity estimates for Hawaii, due precisely to its structure and isolation). Finally, we exclude Nevada and Vermont from all samples due to serious data irregularities in those states.

MEASURING REVENUE COMPOSITION

Our analysis of revenue composition focuses on state and local revenue, which we disaggregate by source and type. Doing so, however, is not as straightforward as one might imagine. Despite the best efforts of the U.S. Census Bureau to standardize data collection across states, the sheer heterogeneity and complexity of state budgets and finance systems generates particularity that complicates measurement even with aggregate state-level indicators. We discuss a couple of these issues below, in addition to present-

ing basic information about the measures we use in our analysis.

Revenue composition by source. When looking at K-12 revenue by government (level) source, we use data from the U.S. Census Bureau's annual survey of school system finances (U.S. Census Bureau 2022a), which includes both "shares" of revenue from local, state, and federal sources (for our models), as well as the per-pupil revenues (for a supplemental few graphs and illustrations).

Unfortunately, linking revenues received by school districts to students served by those revenues in their districts is not easy, mainly because school districts collect some revenues that are used to provide services to communities as well as to students who attend schools elsewhere, and these classifications vary state by state. The revenue shows up as received by the district, but the students on whom those revenues are spent may not be included in the enrollment counts for that district if, for example, they attend charter schools run by nongovernmental entities (which are not required to report their finances to the federal government). This often leads to significantly overstating revenues per pupil in districts with larger charter school sectors. Because most of our *revenue by source* analyses focus on revenue shares rather than per-pupil amounts, this mismatch issue is not as serious a problem as it usually is. However, in our spending volatility outcomes, as well as when we present per-pupil amounts (as we do in a few descriptive analyses), we take steps to correct total revenue amounts so that they only include categories of funding that are "matched" to reported enrollments.

Similarly, identifying K-12 revenue that is *from the state* or *from local property taxes* should be relatively transparent, simple, and comparable across states or over time within the same state, but it too is not straightforward. For example, many states require that local districts raise a target amount of revenue toward their own funding targets, either by a fixed local property tax rate or some other calculation based on local wealth and income. In the U.S. Census data that we use, the revenues generated by these state-imposed property taxes are sometimes counted

as state revenues and other times as local revenues. We bear this in mind when interpreting our results.⁶

Revenue composition by tax type. For a relatively small group of models, we also look at composition by tax type, which in our context refers to whether revenues are derived from income, property, or sales taxes. As we discuss below, these are not the only types of taxes levied by state and local governments, nor are taxes the only source of revenue that states and localities receive. That said, we once again look at these revenues at the aggregate state level. Broadly, these include revenues derived from the following taxes:

- Municipal and school **property taxes**
- Local, county, and **state sales and excise taxes**
- Local (where applicable) and state **income taxes**

We once again use data from the U.S. Census Bureau (U.S. Census Bureau 2022b). These data are only used to construct one variable (percent of total state and local revenue from income taxes) in a few of our models. We also use them to generate a few descriptive figures, including Figure 3, above, and a couple noted below.

It is important to note that these revenue-by-tax-type data represent revenues collected for *all public goods and services, not just education*. For local property tax revenues, one can usually separate school from municipal taxes and draw direct connections between revenue by tax type and the schools that this revenue supports. We cannot, however, do the same for state revenue—e.g., we cannot separate state sales from income taxes when looking at K-12 school revenue. These revenues largely get put into a state general fund “pot.” They are essentially mixed together and then distributed to local districts through state aid formulas. If the overall state pot is filled 50/50 with sales tax and income tax revenues, then each district’s state aid might reasonably be assumed to be similarly constituted, even if districts will be receiving very different total amounts of state aid. In any case, for data on revenues by tax type—totals, accumulated for all tax types and all public goods and

services—we can only report and analyze them here at the state level (per capita in constant dollars).

Nevertheless, elementary and secondary education does tend to be the largest single share of any state’s public expenditures, especially when considering all state *and* local sources of taxing and spending. On average, current K-12 education spending constitutes about 40-45 percent of total annual state and local revenues.

MEASURING ADEQUACY AND EQUITY

Our adequacy and equity measures are the first of two types of primary dependent variables in our analysis (the other being volatility). In this case, we are interested in whether and how revenue composition might influence the adequacy and equity of K-12 spending. These state-level estimates, however, must be constructed using district-level data and models.

As noted above, for a school funding system to provide for all children to have equal opportunity to learn, it must set adequate funding levels for each district. But each district serves a unique student population and does so under a unique set of conditions—from large urban centers to remote rural spaces, from schools serving large shares of low-income and minority students to schools in affluent sprawling suburbs. These varying conditions and student populations create vastly different costs for districts, even when working to achieve common outcome goals.

To determine the different costs for different school districts, we use estimates from the National Education Cost Model (NECM), which is available as part of the School Finance Indicators Database (SFID) (Baker, Di Carlo, Weber, et al. 2022a). As stated above, *cost* is the amount of funding necessary for a school district to meet a stated education outcome. The NECM estimates this cost empirically using a national database of school district finance data in combination with data on student and district characteristics. These data are matched with outcome data: specifically, test scores in reading and math for students in grades 3-8 that have been statistically

⁶ Further, when states reform their school funding systems, they sometimes change how they classify and report these revenues to the federal government (our data source). This happened, for example, in the Census finance data for both Vermont and New Hampshire in the late 1990s, wherein a significant share of revenues generated by local property taxes were suddenly reported as state revenues. Kansas, by contrast, adopted similar reforms earlier in that decade, but does not report the property tax revenues generated by state minimum mill levies as state revenues.

transformed to make them comparable across all states (Reardon et al. 2021). The model determines how student population characteristics (percentage in poverty, percentage of English language learners, percentage of students with disabilities, etc.) and district characteristics (relative wage costs, enrollment size, grade-level enrollments, etc.) affect student outcomes, and how much funding is needed to reach a specified goal (or “benchmark”) given these variations. We then compare these estimated adequate funding levels, in each district, with actual spending levels, which indicates the adequacy of funding in that district. These district-level estimates are used to construct our two state-level outcomes, discussed below. For more details on the NECM, see Baker, Weber, and Srikanth (2021).⁷

The common goal that we set as the adequacy “benchmark” is relatively modest: national average outcomes in reading and math. Because this goal is based on an average, many students will, by definition, not achieve it. This outcome standard could, of course, be raised or lowered; however, changes in the outcome would necessarily change the amount of spending necessary to achieve that outcome. We choose here to stick with the national average as it is a goal that is reasonably attainable for all or most districts. Moreover, since our analysis here assesses both adequacy and equity in relative terms (i.e., comparisons within and between states), the choice of common goal will have relatively little appreciable effect on our results.

To be clear, the spending targets we use here—i.e., the NECM estimates—are just that: estimates. There is no guarantee that a district spending at its target will reach the stated goal (national average test scores in math and reading for Grades 3–8). Districts certainly will have characteristics that are not captured by our model that affect spending, requiring them to spend more or less than the target to meet the goal. Districts may also choose to spend revenues on

legitimate educational programs that will not affect test scores (sports, the arts, counseling services, etc.). Further, some districts may, in fact, engage in practices that make them more fiscally efficient or inefficient than others.

Despite these caveats, the spending targets we use herein are reasonable estimates, based on actual data, of the cost of achieving a basic level of equal educational opportunity across all school districts. As such, they are useful for our current goal: assessing the adequacy and equity of school spending within and between states for the purposes of examining the relationship of those outcomes with revenue composition. In the analyses that follow, we use two different measures (also see Box 1), both of which are constructed using the district-level adequacy estimates from the NECM:

1. **Statewide adequacy (adequacy):** This is an *overall* measure of how adequately states fund their schools. We measure statewide adequacy in two ways:
 - a. **Percent adequate:** Percent adequate is simply the percentage of students in a given state and year who attend schools in districts in which actual per-pupil spending is equal to or greater than estimated adequate levels.⁸
 - b. **Average adequacy gap:** The statewide adequacy gap is the average difference (weighted by enrollment) in a given state and year between actual per-pupil spending and adequate per-pupil spending (to achieve national average outcomes) for each state, expressed as a percentage. For example, a value of 10 percent indicates that the typical student’s district spends 10 percent above estimated adequate levels, while a value of -10 percent indicates spending 10 percent below adequacy targets.
2. **Within state equal opportunity (EO) gap (equity):** Within-state equal opportunity, which we also call “equity” in this report, is represented by the

⁷ In addition to the SFID’s district-level dataset of finance, student characteristics, and other variables (not published), the NECM relies heavily on three additional data sources. The first is the Comparable Wage Index for Teachers (Cornman et al. 2019), an index of regional wage and salary variation developed by Dr. Lori Taylor of Texas A&M in collaboration with researchers at the National Center for Education Statistics (Taylor 2014; Taylor, Fowler, and Schneider 2006). The second is the EDGE School Neighborhood Poverty Estimates, also published by the NCES, which is specifically designed to measure poverty surrounding schools and districts (Geverdt 2018). The third and perhaps most important NECM data source is the Stanford Education Data Archive, a groundbreaking database of nationally normed test scores going back to 2009 (Reardon et al. 2021). The SEDA allows for a better comparison of individual district’s test results across all states, a crucial tool for producing cost model estimates that are comparable across the United States.

⁸ We typically prefer to use the percent of students in districts with funding below (rather than above) adequate levels, since our modest outcome goal (national average test scores) lets us say with confidence that districts with funding below our estimated targets are inadequately funded, but not that districts above the targets are adequately funded (as “percent adequate” would seem to imply). We choose percent adequate here so that the “directions” of all our adequacy and equity variables are consistent, with positive effects/changes indicating desirable outcomes (i.e., more adequate or equitable funding).

difference between the average adequacy gap for the typical child in the highest-poverty quintile (20 percent) of districts and that of the average child in the lowest-poverty quintile, expressed in percentage points. For example, if the lowest-poverty districts spend, on average, at 30 percent above estimated adequate levels (adequacy gap of +0.30, or +30 percent) and the highest-poverty districts spend 20 percent below estimated adequate levels (adequacy gap of -0.20, or -20 percent), the EO gap would be $-0.2 - 0.3 = -0.5$, or -50 percentage points. Larger gaps, of course, represent more equal opportunity, but note that gaps in virtually all states and years are negative (i.e., funding is less adequate in the highest-poverty than in the lowest-poverty districts), and so “larger gaps” typically mean smaller negative gaps.⁹

Although our two statewide adequate measures are highly correlated and both are useful, we generally prefer the percent adequate measure in the context of this analysis, since it does a better job of capturing how *widespread* adequate funding is across a state. Average adequacy gaps, in contrast, are subject to inflation by districts where actual spending exceeds estimated adequate spending by enormous margins, which means that average gaps might be relatively positive even if majorities of students attend school in underfunded districts.

On a related note, it is possible for a state to have relatively adequate funding overall but to also have very large EO gaps. In fact, states in which funding is more adequate tend to be those in which opportunity is most unequal, and vice versa (Baker, Di Carlo, and Weber 2022). This is true in states such as Connecticut and New Jersey, for example, where average spending is widely adequate (at least by the modest standard of national average student outcomes) but the gaps between rich and poor are very large.

We have estimates for both adequacy and EO/equity, by state, between 2009 and 2020. We cannot go back any further because nationally normed testing data

are not available. All statewide adequacy and equity estimates used in our models are available directly (or can be easily calculated using the resources available) at: <http://schoolfinancedata.org>.

MEASURING VOLATILITY

Our second set of models focuses on the relationship between revenue composition and the volatility (or, conversely, stability) of K-12 spending over time. Drawing on the existing literature (e.g., Cornia and Nelson 2010; Seegert 2016), we construct three measures to capture different forms and patterns of spending volatility between 1998 and 2020. These three measures are summarized in Table 2, and illustrated in Figure 4 using data from New Jersey

The first and simplest volatility measure (absolute year-to-year change, or ABSCHG in Table 2) is the absolute difference in per-pupil spending between any given year t and the prior year $t-1$ as a percentage of per-pupil spending in year t . If, for example, a given state spent \$15,000 per pupil in 2018 and \$16,000 per pupil in 2019, then the value of ABSCHG in 2019 would be the absolute value of the difference between 2018 and 2019 ($\$16,000 - \$15,000 = \$1,000$) divided by 2019 per-pupil spending: $\$1,000 / \$16,000 = 0.0625$ or 6.3 percent. Note, of course, that the value of ABSCHG would still be 6.3 percent had spending *decreased* from \$17,000 to \$16,000 between 2018 and 2019. In all three measures, we are interested in the volatility of spending rather than whether it increased or decreased.

This is clear in the illustration of ABSCHG in the top panel of Figure 4 (which, again, uses data from New Jersey). The left graph shows the actual year-to-year percentage change in K-12 spending (positive or negative) between 1998 and 2020. During this time period in New Jersey, some year-to-year changes were negative and some were positive. And, to some extent, they balance each other out. In the right graph, in contrast, we present the absolute values of those changes (and so large negative changes

⁹ Adequacy gaps can be calculated for any state/year combination as the percentage difference between statewide average spending per pupil (`necm_ppcstot_state`) and statewide average estimated costs per pupil (`necm_predcost_state`) in the SFID's State Indicators Database. Equal opportunity gaps can be calculated (also in the State Indicators Database) by calculating the average adequacy gap for the highest-poverty quintile of districts in a given state/year (the percentage difference between `necm_ppcstot_q5` and `necm_predcost_q5`) and subtracting it from the average adequacy gap for the lowest-poverty districts in that state/year (the percentage difference between `necm_ppcstot_q1` and `necm_predcost_q1`). Equal opportunity gaps can be calculated in a given state/year using the SFID's District Adequacy Database as an enrollment-weighted average of a dummy variable measuring whether spending (`ppcstot`) is equal to or greater than estimated costs (`predcost`) in each district. Note that the most recent district-level adequacy estimates that have been published as of the release of this report include data between 2009 and 2019, but our analysis also includes 2020 estimates. These latter estimates (as well as updated estimates for all previous years) will be published in early 2023. All of these datasets are freely available at: <http://schoolfinancedata.org>.

TABLE 2. DESCRIPTION OF K-12 SPENDING VOLATILITY MEASURES

Volatility measure	Time period (varies by)	Calculation	Interpretation
Absolute change (ABSCHG)	Year to year (1998-2020)	Absolute year-to-year change in direct K-12 per-pupil spending as a percentage of direct per-pupil spending or $\text{abs}(X_t - X_{t-1}) / X_t$	What's the overall magnitude of change in spending from one year to the next?
Time Period Volatility (TPVOL)	By period: pre-recession (1998-2006); recession (2007-13); post-recession (2014-20)	Standard deviation of the absolute change in direct K-12 per-pupil spending within each combination of state and time period divided by the mean for the period	What's the average variation in change in spending for the three periods, relative to the average amount of variation?
Trend Volatility (TRNDVOL)	Year to year (1998-2020)	Squared standardized residuals from regression of direct K-12 per-pupil spending on year and state	What's the overall magnitude of change in spending from one year to the next, relative to the average annual change?

essentially appear as large upward swings in the graph). This captures the size, or magnitude, of the variation alone without regard for whether it was upward or downward.

The second volatility measure in Table 2 (TPVOL), which is also presented for New Jersey in Figure 4 (in the middle panel), is constructed by first dividing our panel dataset into three time periods: pre-recession (1998 to 2006); “K-12 recession” (2007-2013); and post-recession (2014-2020).¹⁰ We then calculate the standard deviation of absolute year-to-year changes within each state and time period—i.e., the amount of variation in year-over-year changes for each period/state combination, taking both positive and negative changes. We divide the standard deviation for each period by the mean for that period, to put that variation from all states onto a common (proportionate) scale. This is done by time periods to capture the average amount of variation over these periods, rather than each year-to-year change. So, for instance, was the average year-to-year change during

this time period greater or less than it was during other time periods? A larger change in a single year might be offset by more stability around that change during any particular period.

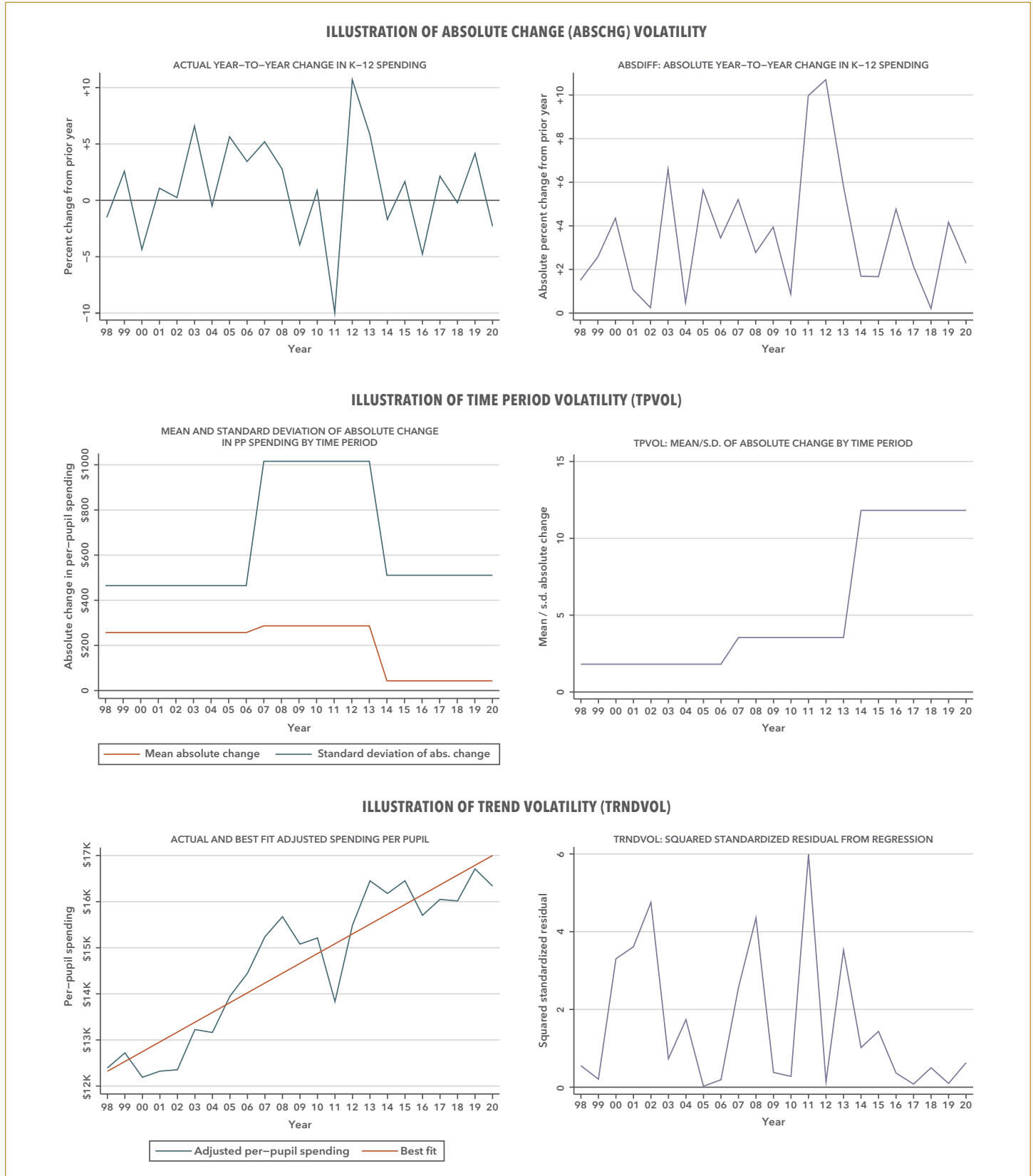
In the middle panel of Figure 4, the left graph shows the mean and standard deviation of the change within each of the three time periods in New Jersey, with the standard deviation divided by the mean (the time period volatility, or TPVOL measure in Table 2) in the right graph. For example, in the first (pre-recession) time period, the mean change was about \$250 per pupil and the standard deviation was approximately \$500, and so the TPVOL ratio in the graph on the right is 500/250, or about 2. Since these are all calculations within time periods, there is a kind of “step-and-plateau” trend in both graphs (you can think of these graphs as trend bar graphs connected by lines). Note that, in New Jersey, TPVOL (the right graph) is by far highest in the third (post-recession) time period, because the mean change during this period was quite small (the rightmost plateau in the

¹⁰ The “official” duration of this recession was 2007-2009, but its impact on school budgets lasted far longer (Baker and Di Carlo 2020). We therefore conceptualize the time period 2009-2013 as the “K-12 recession.”

FIGURE 4

Illustration of three volatility measures

Trend in “underlying” and final outcome measures of volatility (absolute change, time period volatility, and trend volatility) in New Jersey, 1998-2020



Note: All data are for New Jersey only. See text for more discussion of each panel.

DATA SOURCE: U.S. CENSUS BUREAU

orange line in the left graph is roughly \$50 per pupil) but the standard deviation of that change (the right-most plateau in the teal line) was comparatively high (around \$500 per pupil); basically, there were large increases and decreases during this period that mostly cancelled each other out. As a result, volatility according to TPVOL is severe during this time period even though the mean and standard deviations for this period are both equal to or lower than they are for the two previous periods (since the denominator is so low). In this measure, in other words, volatility is defined within time periods relative to the mean.

Third and finally, we use a regression-based approach (trend volatility, or TRNDVOL in Table 2), in which we calculate the standardized residual around the longitudinal trend for spending and square that residual (for each state) to generate only positive values representing the magnitude of variation around the trend. Put more simply, we calculate the trend in spending between 1998 and 2020 as if it were a perfectly straight, upward sloping line, and then we measure how much the actual trend in spending “wraps around” (or diverts from) that line (once again, in absolute terms, without regard to whether the actual trend “wraps” above or below the fitted trend). These diversions are called “residuals.” The left graph of the bottom panel Figure 4 shows how the actual spending trend in New Jersey wraps around the “fitted” trend, whereas the right graph in the bottom panel presents the actual values of TRNDVOL (which looks somewhat similar to the ABSCHG trend).

The models using these three volatility measures, like the illustrative New Jersey graphs in Figure 4, include data between 1998 and 2020. This sample (i.e., the number of years) is larger than that for our adequacy and EO models because we are no longer constrained by the availability of normed testing data, which limits the NECM sample to 2009-2020.

METHODS AND MODELS

We estimate a series of regression models designed for panel data, which are data that include multiple cases (in this case, states) over multiple time periods (in this case, years). The purpose of these models is to examine the relationship between revenue composition (source and type) and the adequacy, equity, and stability/volatility of school district spending. They

include “between effects” and “fixed effects” models of adequacy/equity, and “random effects” models of volatility. Between effects models look at variation across states over time whereas fixed effects models look at variation within states over time. Random effects models estimate an average of “between effects” (between states) and “fixed effects” (within states over time).

They are all state-level models (observations represent state/year combinations) that examine the connection between K-12 revenue (composition) and spending (adequacy, equity, and volatility). As discussed above, there are compelling reasons to believe that composition might influence these spending outcomes, but there are also potentially important factors that could offset or even nullify these effects. The purpose of our models is to test these associations. We will describe these models in greater detail as we present them in the next section.

In the meantime, we emphasize that our state-level models and data are not particularly well-suited for untangling cause and effect—i.e., they are appropriate for determining whether there is some connection between composition and adequacy, equity, and volatility, not necessarily whether variation in composition actually causes these outcomes.

Although most of our models include fixed effects—i.e., they examine whether changes in composition are associated with changes in our three outcomes within states over time, which might help to account for differences between states—there is too much complexity, and too many measurable and unmeasurable potentially confounding factors, for us to draw any causal conclusions. We do, however, interpret our results as evidence of the possibility that composition may influence adequacy, equity, and volatility, and that our findings, therefore, may be of relevance to policymakers and advocates seeking to improve these outcomes.

A note on the pandemic recession. Events over the past two to three years merit a brief mention. In mid-2020, the general consensus was that school budgets were about to take a second catastrophic hit in just over a decade, this time due to COVID-19 and the pandemic-fueled economic downturn (Baker and Di Carlo 2020). The outlook has improved a great deal. As of late 2022, most states were report-

ing at least fairly strong fiscal conditions and minimal budget cuts (NASBO 2022). Moreover, thanks to timely federal aid and a relatively quick recovery, the pandemic did not create the massive damage that was expected in 2020 and 2021. While there is still a substantial amount of uncertainty, including the condition of budgets when federal aid runs out over the next few years, public schools seem to have mostly dodged a bullet.

In any case, the latest data in this report pertain to the 2019-20 school year, a time period that includes only the earliest months of the pandemic. We do not believe that the influence of composition on school funding adequacy, equity, and volatility during the brief “pandemic recession” and its aftermath will be large or persistent, but that remains to be seen. In any case, the release of recent national testing data suggests that the pandemic had a rather severe

negative impact on the testing performance of the current cohort of U.S. students, particularly disadvantaged and struggling (lower-scoring) students (National Center for Education Statistics 2022). We would suggest that one major reason why students in higher-poverty districts bore the brunt of the ill effects—as well as why they were so far behind even before the pandemic—is the vast difference in the adequacy and stability of resources between these districts and their more affluent counterparts. To the degree such outcomes can be improved (or at least better understood) by examining the role of revenue composition, our analysis may speak directly not only to the pandemic recession, but also to economic downturns yet to come.

RESULTS

We begin the presentation of our results with a quick look at how revenue composition (by type and source) varies from state to state. We then present the results of our models examining the relationship between revenue composition and funding adequacy/equity, followed by the results of our models

focused on the association between composition and stability/volatility (including how this relationship varies by district poverty). Finally, we summarize our results and carry out a brief supplemental analysis of property tax bases that is motivated by our main findings.

REVENUE COMPOSITION BY STATE

Most of our analysis focuses on K-12 revenue composition by source (local, state, federal), but since many of the differences between states in their composition by source are due to underlying differences in tax revenue by type (state, sales, property), we begin with Figure 5, in which we present the shares of total tax revenue by tax type and state in 2020. Note that this reflects all state and local tax revenue, not just K-12 revenue (since, as mentioned above, we cannot disaggregate state K-12 revenue by type).

Education spending tends to be among the largest shares of any state budget and of total state and local taxing and spending, but it's not the only expenditure supported by these tax revenues. Local property taxes constitute the majority of local revenue, and they support a variety of other municipal services, such as police and fire protection, libraries, health centers, road maintenance, and numerous other important public services. State taxes likewise support a wide range of services other than K-12 schools.

But not all state and local revenue comes from taxes, and so not all revenue is included in Figure 5. For example, one of the largest sources of revenue in many states is "charges" (e.g., public college and university tuition, highway tolls, etc.). Finally, note that Figure 5 includes but does not separate out all types of taxes; severance taxes, for example, are included in the "other" category, as are so-called selected sales taxes imposed on goods such as alcohol and tobacco.

The typical tax revenue portfolio averaged across these states is relatively balanced. The unweighted averages across the states in Figure 5 are roughly 31 percent of tax revenue coming from property taxes, 36 percent from sales taxes, 24 percent from income

taxes, and the rest (about 9 percent) from other types of taxes (national weighted averages that include all states are no more than 1-2 points different from these totals). Yet these proportions, as the figure shows, vary quite dramatically between states.

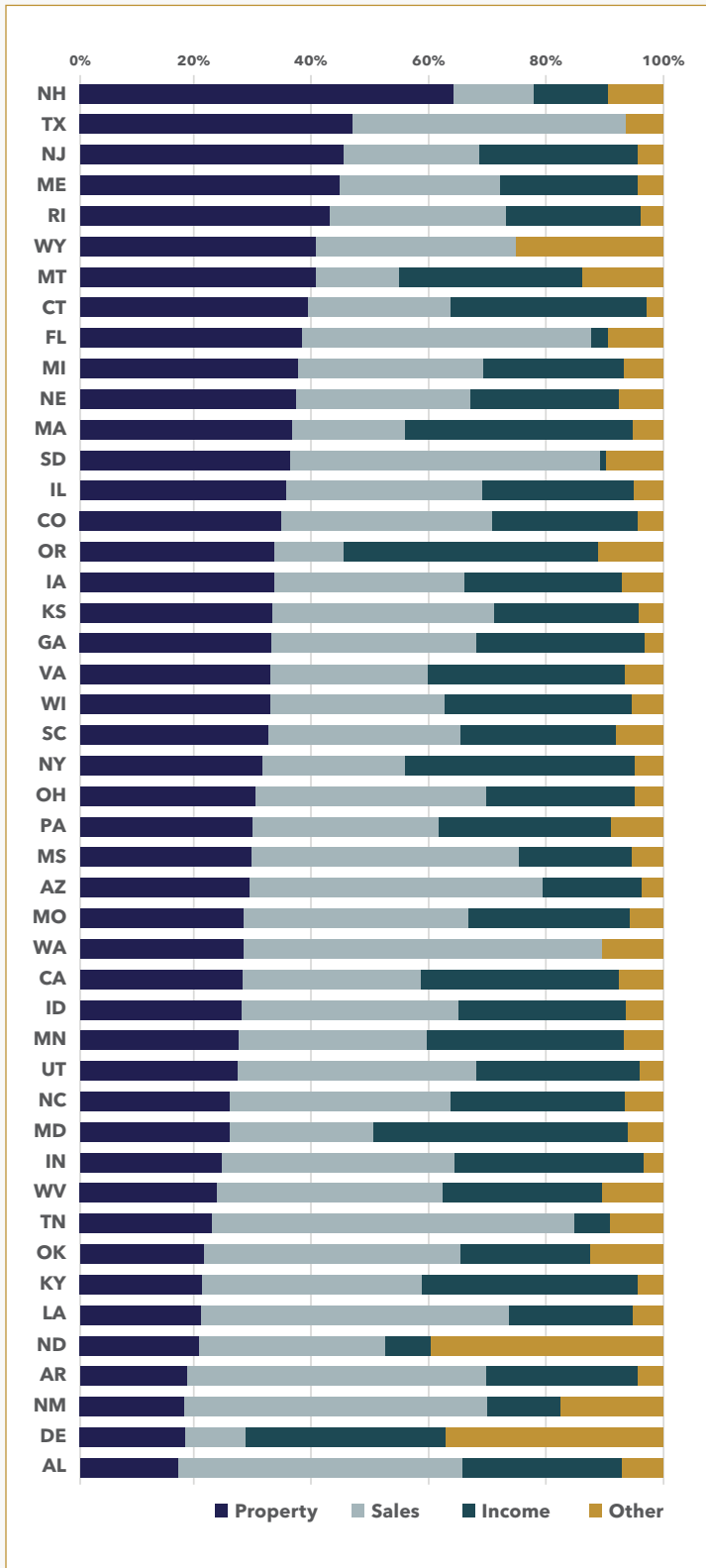
States such as New Hampshire, Texas, and New Jersey rely most heavily on property taxes for their total state and local tax revenue (over 40 percent), but for somewhat different reasons. New Hampshire, for instance, levies neither a general state sales tax nor individual income tax (generating relatively small portions of gray and teal bars in the figure), thus choosing to rely predominantly on property taxes. Yet New Hampshire does tax interest and dividends income and also imposes selective sale taxes. Texas (as a state) does not tax individual income and pulls in virtually no income taxes, relying on property and sales taxes for over 90 percent of its revenue.

In contrast, New Jersey, as well as other states toward the top of the figure (e.g., Maine, Rhode Island, Connecticut, and others), shows how property taxes can constitute a relatively large share of total tax revenue even when all major tax types are levied. These are relatively wealthy states that pull in substantial (mostly local) property tax revenue despite also taxing income and sales.

At the other end of the spectrum, states like Alabama, Delaware, and New Mexico rely much less on property taxes as a share of total tax revenue, but also for somewhat different reasons. Localities in Alabama and New Mexico tax residential property at relatively low rates, on average (Fritts 2022). Delaware, on the other hand, not only taxes property at relatively low rates, but it also collects corporate income and franchise taxes, revenues from which

FIGURE 5
State and local tax revenue composition

State and local tax revenue as a percentage of total tax revenue, by tax type, 2020



Note: Includes all state and local revenue, including but not limited to K-12 education revenue. Graph does not include Alaska, the District of Columbia, Hawaii, Nevada, and Vermont, which are excluded from our main analysis.

DATA SOURCE: U.S. CENSUS BUREAU



are substantial insofar as the state is home to many businesses seeking its lax business laws; this inflates Delaware’s “other” share in Figure 4, which, along with relatively high income tax revenue, compensate for its low property tax rates and lack of general sales taxes.

Finally, given that some of our models will focus on the percent of total state and local revenue from income taxes, it bears noting that the states that rely most heavily on income taxes for their total tax revenue (i.e., Maryland, Oregon, New York, Massachusetts, and Kentucky) all draw at least 37 percent of their taxes from incomes. Conversely, of course, states that rely least heavily on income taxes include those that, as mentioned above, do not impose taxes on income, including Florida, South Dakota, Tennessee, Texas, and Wyoming, while Washington and New Hampshire tax capital gains and investment income only.

Moving on, Figure 6 presents public school district revenue by source (including federal aid) in 2020. Unlike Figure 5, this breakdown includes K-12 education revenue exclusively. Figure 6 is sorted by the share of K-12 revenue from state sources, as this is the compositional variable we will be using in our models, and the revenue sources in Figure 6 appear in a somewhat different order from left to right than did their tax type analogues in Figure 5.

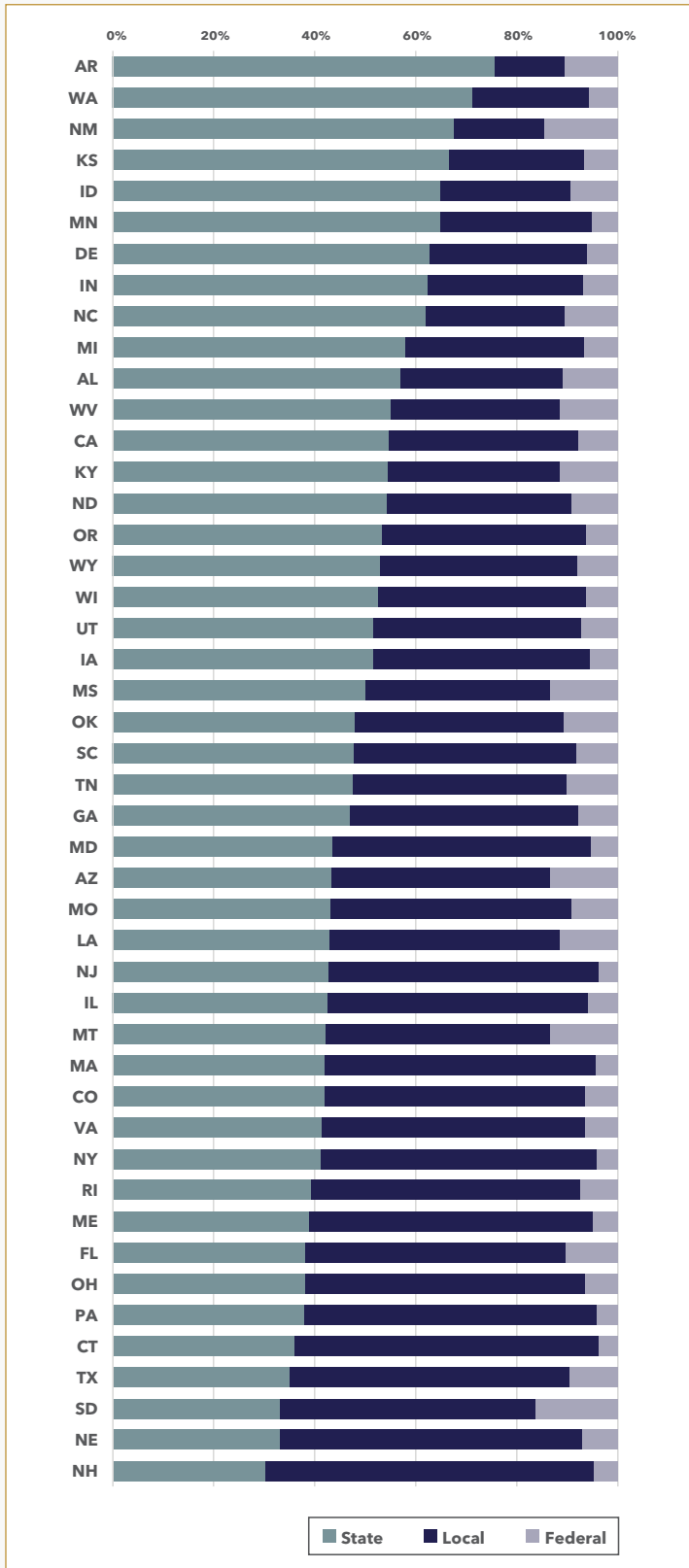
Nationally, on average, about 46 percent of K-12 revenue comes from local sources, 47 percent from state sources, and the rest (7-8 percent) in the form of federal aid (Cornman et al. 2022). In the 46 states presented in the figure, the unweighted averages are similar (49 percent state, 43 percent local, 8 percent federal). Once again, of course, these proportions differ a great deal by state.

As would be expected, on the bottom of the figure we see that the states that rely most heavily on property taxes to raise revenue also tend to receive the largest share of their total tax revenue from local taxes (from Figure 5). This includes New Hampshire, Connecticut, and Nebraska (though some of the “state” revenue shown for New Hampshire schools is derived from property taxes). By contrast, most of the state revenue in Connecticut is derived from income and sales tax, but state revenue constitutes a similar share of total school district revenue as in New Hampshire.

FIGURE 6

K-12 school revenue composition by source

Revenue as a percentage of total K-12 revenue, by governmental level, 2020



Note: Graph does not include Alaska, the District of Columbia, Hawaii, Nevada, and Vermont, which are excluded from our main analysis.

DATA SOURCE: U.S. CENSUS BUREAU



At the other end of figure, several states exhibit unusually high state shares, including Arkansas (76 percent), Washington (71), New Mexico (68), Kansas (67), Idaho (65), and Minnesota (65). Most of these are states with relatively low average property tax rates, which means they rely more heavily on state revenue to fund their schools. This is not entirely a “centralized” decision, as local jurisdictions often have some flexibility in how much they tax their property. However, at least some of these states have, in recent decades, adopted tightly centrally controlled state school finance systems that require relatively low levels of local property taxation to cover the obligatory local share of their formulas, and they impose strict caps on additional local revenue that can be raised. While Kansas, for example, has responded (often due to court orders) by increasing state aid to offset low property tax revenues, New Mexico and Washington have not. This is one of many examples of how the connection between K-12 revenue composition (percent state share) and adequacy/equity may be mediated by contextual factors (including, of course, simple happenstance).

But the primary takeaway from Figure 6 (and Figure 5) is quite simple: states vary widely in their revenue “portfolios.” Local shares of K-12 revenue range from 2 to 65 percent, while state shares run the spectrum between 30 and 90 percent. In some cases, such as states that choose not to levy certain types of taxes, these distributions are the result of deliberate and clear-cut policy choices, but in all states the distributions are a product of decades of policy as well as political and economic conditions. And, of course, the state/local “split” is mediated by federal aid contributions, which depend in large part on the characteristics of states’ populations (e.g., poverty rates).

In any case, in the national debate about school finance, revenue composition is usually expressed in terms of national averages (e.g., 90 percent state and local, about half from each), but in reality the distribution in a great many states does not really resemble that of the nation as a whole. And there is good reason to believe that this interstate variation in revenue “portfolios” may carry important implications for school funding adequacy, equity, and stability.

REVENUE COMPOSITION AND STATEWIDE ADEQUACY

Our first research question focuses on the relationship between revenue composition and the adequacy of K-12 school funding—specifically whether, as we predict, states that rely more heavily on state revenue to fund their schools also tend to exhibit more adequate spending statewide—with adequacy defined in terms of either the percent of students in districts with adequate funding or the statewide adequacy gap (percent difference between actual and adequate spending for the typical student). To reiterate, this prediction is plausible insofar as states that rely more heavily on state revenue, which is pooled and (typically) distributed according to district need and capacity, might achieve more widespread adequate funding thanks to this targeting.

We begin by depicting in Figure 7 the simple bivariate relationship between K-12 revenue composition (specifically the state share of K-12 revenue) and statewide adequacy, with separate panels for the two “versions” of the statewide adequacy measure. These data are for 2020, the latest year for which we have estimates.

The two scatterplots reveal at best an inconsistent association between state share and statewide adequacy. Several states with high state revenue shares, such as Texas and Florida, also have relatively inadequate funding statewide (measured either as percent adequate or the average gap). Conversely, several other states, such as New Hampshire and Connecticut, achieve relatively high statewide adequacy results despite comparatively low state revenue shares.

These plots, however, examine only one year and they do not control for a host of other factors that may shape spending adequacy. For example, some states simply spend more than others, and so what may seem like a “compositional effect” might simply be a result of the resources devoted to schools. In addition, these bivariate relationships only look at differences *between* states, each of which has very different economic conditions to overcome and different tax policy and education funding structures. It is equally important to ask what happens when, *within* each state, the state share is increased or decreased over time? Does adequacy improve?

Accordingly, in Table 3 we present the results of four different models. Two of these models (models 1 and 3 in the table) are “between effects” (BE) regression models, one for each of our two adequacy measures (percent adequate in model 1 and the average adequacy gap in model 3). These models examine the association between composition and adequacy between states—more specifically, they explore whether states that rely more heavily on state revenue to fund their schools tend to exhibit more adequate spending overall. The other two models (models 2 and 4) are “fixed effects” (FE) regression models, which focus on whether adequacy tends to increase when the state share increases *over time*. In these models, states to some extent serve as their own control variables, since any time-invariant factors are essentially accounted for by the within-state focus. The samples of all four models include data from 2009-2020.

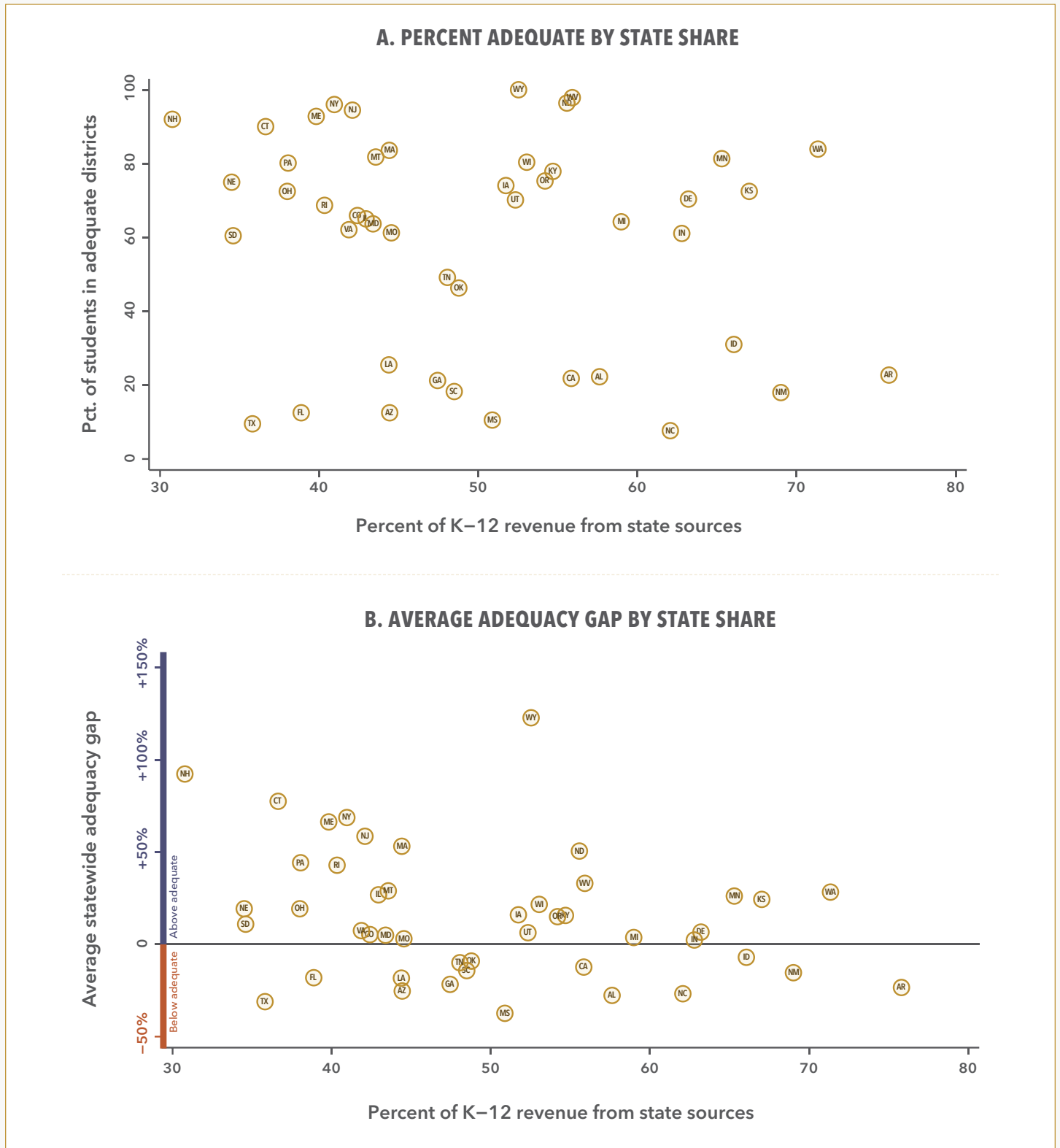
All four models also control for fiscal effort (total state and local K-12 direct spending as a proportion of aggregate personal income), which is from the School Finance Indicators Database (Baker, Di Carlo, Weber, et al. 2022b), as well as the share of K-12 spending from federal sources, which is from the same source as our compositional data (the U.S. Census Bureau). We include the effort variable so as to capture how variation in the state share of K-12 revenue, within or between states, affects adequacy, assuming overall state effort remained constant. This matters because overall effort represents more funding and, thus, at least potential reduction of adequacy gaps. But, does it matter if we simply change where that money is coming from? Similarly, controlling for the federal share allows us to capture the major additional source of revenue that may differ across states or change over time and may affect overall adequacy (and the inclusion of this federal share variable means that we can interpret our state share variable versus the alternative of the local share).

The results in Table 3 offer somewhat mixed evidence regarding the relationship between the share of funding coming from the state and the overall (statewide) adequacy of funding. On the one hand, the state share coefficient from model 2 (fixed effects model) indicates a statistically discernible positive relation-

FIGURE 7

Statewide adequacy by revenue composition

Scatterplots of (A) percent of students in districts with spending above estimated adequate levels by state source share of K-12 revenue and (B) percent difference between actual and estimated adequate spending for the typical student and state source share of K-12 revenue, 2020



Note: Plots represent two approaches to measuring statewide adequacy. Estimates of adequate spending are “benchmarked” to the (modest) common student outcome goal of national average math and reading scores in grades 3-8 (see text for more details on the national cost model from which these estimates are drawn). Average statewide adequacy gaps are weighted by district enrollment. Graph does not include Alaska, the District of Columbia, Hawaii, Nevada, and Vermont, which are excluded from our main analysis.

DATA SOURCE: SCHOOL FINANCE INDICATORS DATABASE; U.S. CENSUS BUREAU



TABLE 3. MODELS OF STATEWIDE ADEQUACY ON K-12 REVENUE SOURCE (STATE SHARE)

Independent variable	Dependent variable (statewide adequacy measure)			
	Percent adequate		Average adequacy gap	
	(1) BE	(2) FE	(3) BE	(4) FE
State share of K-12 revenue	-0.2384 (0.2934)	0.2968** (0.1325)	-0.5917 (0.3878)	0.0567 (0.1461)
Federal share of K-12 revenue	-5.8383*** (1.3214)	-0.2234 (0.1908)	-5.5049*** (1.7465)	-0.4874** (0.2104)
Fiscal effort	10.1053 (6.1031)	7.6837*** (1.0788)	21.7743*** (8.0664)	9.5101*** (1.1897)
Constant	0.7887** (0.3330)	0.1084 (0.0848)	0.0138 (0.4401)	-0.2801*** (0.0936)
Observations	552	552	552	552
R-squared	0.550	0.103	0.533	0.116
Number of states	46	46	46	46

* p<0.10 ** p<0.05 *** p<0.01

Note: Results of between effects (models 1 and 3) and fixed effects (models 2 and 4) regressions of two statewide adequacy outcome measures on compositional and contextual variables (panel dataset of 2009-2020). The “percent adequate” outcome (models 1 and 2) is the percentage of students in each state/year attending school in districts in which actual spending exceeds estimated spending adequate to achieve national average math and reading scores in grades 3-8 (see text for details on cost model). The “average adequacy gap” outcome (models 3 and 4) is the percent difference between actual and estimated adequate spending for the typical student in each state/year (i.e., average gap weighted by district enrollment). See text for details on cost model from which adequacy estimates are drawn. Fiscal effort is total state and local spending (direct on K-12 education) divided by aggregate personal income. All models exclude Alaska, the District of Columbia, Hawaii, Nevada, and Vermont. Standard errors in parentheses.

Data sources: U.S. Census Bureau; School Finance Indicators Database

ship—i.e., our preferred version of the statewide adequacy measure (percent of students in adequately funded districts) increases within states as the state share increases over time.

In the same model type (fixed effects) where adequacy is measured in terms of the percentage funding gap for the typical student (model 4), the coefficient is not significant at any conventional level, but since these estimates apply to (nearly) the entire population of states rather than just a representative sample, it bears noting that this coefficient is also positive

(adequacy increases with state share over time, within states).

On the other hand, the between effects (BE) models (models 1 and 3), which, to reiterate, gauge the association between composition (state share) and adequacy between states rather than over time, both yield state share coefficients that are both not statistically discernible and negative as well (i.e., adequacy actually tends to be lower in states with higher state revenue shares). This certainly does not square with the idea that state revenue might be targeted more

effectively by district need, but it also reflects the fact that, as is evident in the scatterplots in Figure 7, many high-spending states with comparatively wide-spread adequate spending are wealthy states (e.g., the Northeast) that draw substantial revenue from local property taxes (the upper left area of the plots in Figure 7). Conversely, several states with widespread below-adequate funding are heavily dependent on state revenue (the lower right area of the plots). So, states with high state shares may not exhibit more adequacy, and may actually exhibit less adequacy,

but they may also tend to achieve more adequate funding by increasing their state share. This may be especially true in states that strictly regulate and cap local property tax revenues, leaving state aid to be the primary determinant of fluctuations in spending adequacy, including some very low spending states such as Arizona.

Next, in Table 4, we explore whether tax type, specifically the share of revenue generated by income taxes, is related to spending adequacy. The structure and

TABLE 4. MODELS OF STATEWIDE ADEQUACY ON STATE AND LOCAL REVENUE TYPE (INCOME TAX SHARE)

Independent variable	Dependent variable (statewide adequacy measure)			
	Percent adequate		Average adequacy gap	
	(1) BE	(2) FE	(3) BE	(4) FE
Income tax share of S&L revenue	0.3968	-0.3518*	-0.0972	-0.0189
	(0.3766)	(0.1921)	(0.4879)	(0.2152)
State share of K-12 revenue	-0.6688	0.3207**	-0.9631*	0.1361
	(0.4057)	(0.1257)	(0.5257)	(0.1408)
Year		0.0005		0.0000
		(0.0010)		(0.0011)
Constant	0.7622***	-0.6315	0.5683**	-0.0649
	(0.2114)	(1.9576)	(0.2739)	(2.1931)
Observations	552	552	552	552
R-squared	0.074	0.019	0.076	0.002
Number of states	46	46	46	46

* p<0.10 ** p<0.05 *** p<0.01

Note: Results of between effects (models 1 and 3) and fixed effects (models 2 and 4) regressions of two statewide adequacy outcome measures on compositional and contextual variables (panel dataset of 2009-2020). The income tax share variable represents the proportion of all state and local revenue from income taxes (including but not limited to K-12 revenue). The “percent adequate” outcome (models 1 and 2) is the percentage of students in each state/year attending school in districts in which actual spending exceeds estimated spending adequate to achieve national average math and reading scores in grades 3-8 (see text for details on cost model). The “average adequacy gap” outcome (models 3 and 4) is the percent difference between actual and estimated adequate spending for the typical student in each state/year (i.e., average gap weighted by district enrollment). See text for details on cost model from which adequacy estimates are drawn. Fiscal effort is total state and local spending (direct on K-12 education) divided by aggregate personal income. All models exclude Alaska, the District of Columbia, Hawaii, Nevada, and Vermont. Standard errors in parentheses.

Data sources: U.S. Census Bureau; School Finance Indicators Database

details of Table 4 are very similar to those in Table 3, with one key difference for our purposes: in lieu of the federal share variable, the models in Table 4 use a variable measuring the share of total state and local taxes that comes from income taxes. Note that, as discussed above, due to data limitations (most states' finance systems pool state revenue regardless of type) this is the income tax share of all state and local revenue, including but not limited to school revenue. While we can identify the share of K-12 school funding that comes from federal, state, or local sources, we cannot identify the share of state funding that comes from, say, income or sales taxes. Those revenues tend to go into a single pot at the state level that is then distributed to districts.

That said, the purpose of these models is essentially to test whether, all else being equal, greater reliance on income tax revenue is associated with more adequate K-12 spending. As discussed above, states vary widely in the share of their K-12 revenue that comes from state sources (Figure 6), as well as in the share of their total state and local revenue drawn from income taxes (Figure 5). Advocates for increasing reliance on state revenue for schools (with decreased reliance on local property taxes) typically favor increasing state income tax revenue specifically, since state income taxes are progressive in terms of who pays them (i.e., lower-income families pay a smaller proportion of their income than do higher earners) (Wiehe et al. 2018). The models presented in Table 4 test, albeit very roughly, whether greater “fidelity” to this proposal—greater reliance on state income taxes as a share of overall state and local revenue—is associated with improvements in the adequacy of K-12 spending.

These models again include a measure of the share of school revenue that comes from the state to capture the overall importance of state revenue to schools and the likelihood that shocks to any one source (like income taxes) of state revenues would affect school spending. If state share of school funding is small, even if income taxes make up a large part of state and local revenue, they may have a negligible effect on school funding. In other words, if the income tax share of total state and local revenue is higher, is K-12 funding more adequate, regardless of the total state share of K-12 revenue?

The results in Table 4 are inconsistent at best. The coefficient for the income tax share variable is only marginally significant ($p < 0.10$) in one of the models (model 2) and not significant at any conventional level in the other three models. Moreover, the income tax share coefficient is actually negative in three of the models (larger income tax shares are associated with less adequate spending). The sole exception is model 1 (the between state model of the percent adequate outcome), the coefficient for which is positive (but not significant). In short, we find little compelling evidence that states relying more on state income tax revenue exhibit more adequate K-12 spending independently of overall state share. This likely occurs because of the various contextual reasons why some states do and do not rely on income taxes to support state revenues (i.e., the limitations of our state-level models). Some of these reasons are regional, some ideological, and others historical precedent or artifact.

REVENUE COMPOSITION AND EQUITY (EQUAL OPPORTUNITY)

Our second research question, as well as our analytical approach to it, is basically the same as the first, except instead of statewide adequacy we are looking at equity, or equal educational opportunity. As discussed above, we define equity in terms of difference in the average adequacy gap between the highest- and lowest-poverty district quintile within each state. For example, if the lowest-poverty districts spend, on average, at 30 percent above estimated adequate levels (adequacy gap of +0.30, or +30 percent) and the highest-poverty districts spend 20 percent below

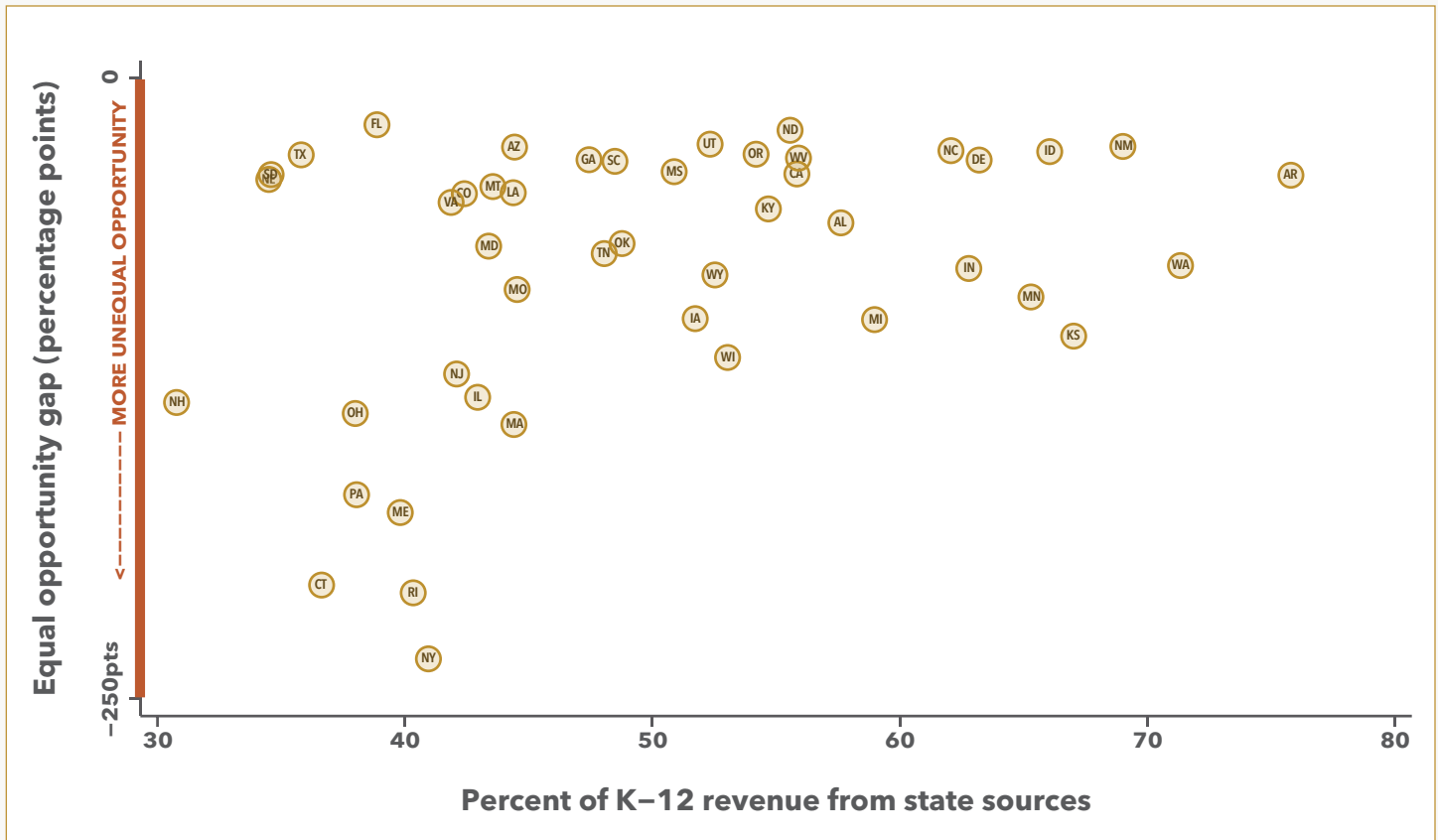
estimated adequate levels (adequacy gap of -0.20, or -20 percent), the EO gap would be $-0.2 - 0.3 = -0.5$, or -50 percentage points. Larger gaps (or, far more commonly, smaller negative gaps), of course, represent more *equal* opportunity.

We begin once again by examining the simple bivariate relationship between composition and equity. The scatterplot in Figure 8 depicts the association between the percent of each state's K-12 school revenue from state sources and its EO gap. Note that

FIGURE 8

Equal educational opportunity gaps (equity) by revenue composition

Scatterplot of the difference in the average adequacy gap (percent difference between actual and estimated adequate spending) between the highest- and lowest-poverty districts and state source share of K-12 revenue, 2020



Note: Equal opportunity (EO) gaps are expressed in percentage points; for example, a gap of -50 points means that the (weighted) average adequacy gap among the lowest-poverty quintile of districts in that state is 50 percentage points higher than that of the highest-poverty districts. District (Census) poverty quintiles are defined state by state. Estimates of adequate spending are “benchmarked” to the (modest) common student outcome goal of national average math and reading scores in grades 3-8 (see text for more details on the national cost model from which these estimates are drawn). Graph does not include Alaska, the District of Columbia, Hawaii, Nevada, and Vermont, which are excluded from our main analysis.

DATA SOURCE: SCHOOL FINANCE INDICATORS DATABASE; U.S. CENSUS BUREAU



EO gaps (on the vertical y axis) toward the top of the plot (smaller negative gaps, which are of course larger numbers) are those in which opportunity is more equal, even though there is not a single state in which the gap is any larger than -18 points (i.e., the adequacy gap in the highest-poverty districts is 18 points lower than the gap in the lowest-poverty districts).

The plot depicts a somewhat unusual relationship between state share and EO gaps. There is no obvious linear relationship there, with most states arrayed in a horizontal cluster across the top of the plot area. On the other hand, it is clear that the seven to 10 states with enormous EO gaps (in the bottom of the plot) are all states in which a relatively low share of total K-12 revenue comes from state sources. No state with greater than a 50 percent state share has a very

large EO gap. This includes almost the entirety of the Northeast region. This region is where the idea of property tax funding of schools was essentially founded, and has evolved for well over a century into a patchwork of highly fragmented municipal and district boundaries with schools that have long been dependent on local revenue but have bumped up against progressive political ideals leaning toward the equity of state aid (Baker 2018).

Once again, we turn to multivariate regression models for panel data to more thoroughly examine the association between composition and equity. The models presented here are the same as those presented for statewide adequacy above, except there is only one “version” of our EO measure rather than two. Table 5 presents the result of the models of equity (EO

TABLE 5. MODELS OF EQUAL OPPORTUNITY GAPS ON K-12 REVENUE SOURCE (STATE SHARE)

Independent variable	(1) BE	(2) FE
State share of K-12 revenue	1.7388***	0.3730
	(0.5494)	(0.3445)
Federal share of K-12 revenue	9.0500***	-2.9105***
	(2.4742)	(0.4961)
Fiscal effort	-33.5164***	-31.6371***
	(11.4272)	(2.8059)
Constant	-1.2499*	0.4379**
	(0.6234)	(0.2207)
Observations	552	552
R-squared	0.632	0.320
Number of states	46	46

* p<0.10 ** p<0.05 *** p<0.01

Note: Results of between effects (model 1) and fixed effects (model 2) regressions of statewide equal opportunity gaps on compositional and contextual variables (panel dataset of 2009-2020). Equal opportunity (EO) gaps are expressed in percentage points (positive coefficients indicate more equal opportunity); for example, a gap of -0.50 (-50 percentage points) means that the (weighted) average adequacy gap among the lowest-poverty districts in that state is 50 percentage points higher than that of the highest-poverty districts. District (Census) poverty quintiles are defined state by state. Estimates of adequate spending are “benchmarked” to the (modest) common student outcome goal of national average math and reading scores in grades 3-8 (see text for more details on the national cost model from which these estimates are drawn). Fiscal effort is total state and local spending (direct on K-12 education) divided by aggregate personal income. All models exclude Alaska, the District of Columbia, Hawaii, Nevada, and Vermont. Standard errors in parentheses.

Data sources: U.S. Census Bureau; School Finance Indicators Database

gaps) on state revenue shares (again with controls for effort and federal shares). Positive coefficients indicate *more equal* opportunity—i.e., smaller discrepancies in adequacy gaps between states’ highest- and lowest-poverty districts.

The coefficients from the between effects (BE) model (model 1) suggest that states with larger shares of revenue from state sources tend to exhibit more equal educational opportunity (smaller EO gaps). We interpret this to be a result of the fact that state aid is typically targeted at districts with greater need and less local capacity, which, all else being equal, may reduce adequacy discrepancies between high- and low-poverty districts (i.e., may increase equity or equal opportunity as we define it).¹¹

Moving on to the fixed effects (FE) model (model 2), we find that increases in the share of states’ K-12 revenue coming from state sources are also associated with more equal opportunity (i.e., a positive coefficient), but this estimate is not statistically significant at any conventional level. In short, within the time frame of our sample (2009-2020), running larger shares of funding through the state formula, all else being equal, does seem to be associated with within-state reductions in EO gaps over time, but this relationship is not sufficiently systematic, or consistent, to produce statistically significant estimates.¹²

Table 6, which is analogous to Table 4, examines whether EO gaps are associated with the percent of total state and local revenue coming from income taxes specifically. As with the models presented in Table 4, the purpose here is to evaluate whether the most common equity-focused proposal for compositional reform—greater reliance on state aid over local revenue, specifically on state income taxes, which are progressive—is associated with better outcomes, in this case more equitable K-12 spending. To reiterate, our income tax share variable represents the proportion of all state and local revenue from income taxes, not just the share of K-12 revenue (since we cannot separate out income tax from other types of state revenue going to schools).

Table 6 suggests that greater reliance on state income taxes is actually associated with *less* equal educa-

¹¹ It bears noting that the effort coefficients from both models are negative (and statistically discernible). This suggests, somewhat counterintuitively, that states that put forth more overall effort, whether in any given year or over time, actually tend to have larger EO gaps, all else being equal. This is partly because differences and increases in overall effort are largely driven by the high/higher spending in districts that have relatively low needs (in wealthy states). Much of this is local revenue from property taxes, which tends to exacerbate K-12 inequity.

¹² Another, more typical equity type of measure we might use here is progressivity, which in the SFID is the degree to which higher-poverty districts in a given state receive more revenue than that state’s lower-poverty districts, controlling for labor costs, population density, and district size. We have chosen equal opportunity as defined here, as we feel the latter is a far more useful and appropriate indicator for assessing the fairness and equity of states’ funding systems. Put simply, while progressive funding is generally required for equal opportunity (since costs increase with poverty), we are opting for a direct measure of equal opportunity, one that reflects both progressivity (i.e., states that provide more funding to their higher-poverty districts will perform better on our equal opportunity measure), as well as the fact that different states require different degrees of progressivity to achieve equal opportunity. That said, the same models but with progressivity as the outcome also yield positive coefficients, except the FE model’s coefficient is statistically significant rather than that from the BE model. This certainly supports our prediction that greater reliance on state revenue is associated with more equitable K-12 spending.

tional opportunity; column/model 2 suggests that increases in the share of revenue from state income taxes may be associated with decreases in equal opportunity over time (we cannot say so with any confidence because the latter coefficient is not statistically significant at any conventional level). The finding from the between effects (BE) model (model 1) is due in no small part to the fact that wealthy, politically progressive Northeast states with high inequality tend to rely more heavily on income taxes. These

states do have relatively adequate funding, but they also tend to have large equal opportunity gaps (stemming in large part from high inequality between their costs), even those states, such as New Jersey, that target their state aid well in an effort to reduce those gaps; the massive inequality in local revenue swamps the highly targeted state aid. Yet, changing the shares of revenue coming from state sources or the share generated by income taxes does not seem to improve, nor worsen, the equal opportunity gaps (as is evident in the fixed effect model in Table 6).

TABLE 6. MODELS OF EQUAL OPPORTUNITY GAPS ON STATE AND LOCAL REVENUE TYPE (INCOME TAX SHARE)

Independent variable	(1) BE	(2) FE
Income tax share of S&L revenue	-1.4321** (0.7032)	-0.4101 (0.4548)
State share of K-12 revenue	2.5519*** (0.7577)	0.0557 (0.2975)
Year		0.0368*** (0.0023)
Constant	-1.7811*** (0.3948)	-74.8673*** (4.6349)
Observations	552	552
R-squared	0.246	0.384
Number of statefp	46	46

* p<0.10 ** p<0.05 *** p<0.01

Note: Results of between effects (model 1) and fixed effects (model 2) regressions of state-wide equal opportunity gaps on compositional and contextual variables (panel dataset of 2009-2020). The income tax share variable represents the proportion of all state and local revenue from income taxes (including but not limited to K-12 revenue). Equal opportunity (EO) gaps are expressed in percentage points (positive coefficients indicate more equal opportunity); for example, a gap of -0.50 (-50 percentage points) means that the (weighted) average adequacy gap among the lowest-poverty quintile of districts in that state is 50 percentage points higher than that of the state's highest-poverty districts. District (Census) poverty quintiles are defined state by state. Estimates of adequate spending are "benchmarked" to the (modest) common student outcome goal of national average math and reading scores in grades 3-8 (see text for more details on the national cost model from which these estimates are drawn). Fiscal effort is total state and local spending (direct on K-12 education) divided by aggregate personal income. All models exclude Alaska, the District of Columbia, Hawaii, Nevada, and Vermont. Standard errors in parentheses.

Data sources: U.S. Census Bureau; School Finance Indicators Database

REVENUE COMPOSITION AND VOLATILITY/STABILITY

We now pivot away from adequacy and equal opportunity to examine how revenue composition is associated with the volatility (or stability) of school spending. Revenue volatility itself is not problematic if it somehow cancels itself out or can be moderated in some way—smoothed over time—such that it doesn't lead to actual budgeting and spending volatility (e.g., it is offset by increases in federal aid). If, on the other hand, revenue volatility affects what can be spent to provide programs and services—and if that volatility is somehow affected by the composition of revenue—these relationships may require more attention.

The analyses presented in this section are therefore focused specifically on addressing our third research question: whether states that rely more heavily on state (versus local) revenue to fund schools also exhibit more volatility spending over time (we also test whether that association varies by state-level poverty). We shall once again begin with a quick presentation of descriptive analyses illustrating the connection between revenue shares and spending volatility. Given the nature of this outcome, however, it is perhaps most useful for us to focus this descriptive analysis on a small number of states, rather than summarize longitudinal trends across all states (see Figure 3 for the national trend in state and local revenue by tax type and K-12 spending). Revenue "portfolios" for all states included in our analysis, including trends over time, are available at the online data visualization accompanying this report: <http://shankerinstitute.org/revviz>.

Figure 9 presents descriptive trends in composition and volatility for four states: California, Connecticut, New Jersey, and Texas. We include California and Texas because they are the two most populous states, but they maintain somewhat different revenue portfolios, with California among the states most reliant upon state revenue (as a share of K-12 revenue) and Texas among the least reliant states. We also include Connecticut and New Jersey as two states with compositions that are somewhat different from those of California and Texas (i.e., more local revenue-dependent) but similar to each other. One important difference between Connecticut and New Jersey, however, is that New Jersey targets more state aid to higher-poverty districts in an effort to mitigate disparities and accommodate needs.

In Figure 9, the left side panels present the trend in K-12 revenue composition by source (local, state, federal) for each state between 1998 and 2020. The graphs on the right present, over the same time period, year-to-year changes (as a percentage) in local revenue, state revenue, and total K-12 spending. California is the only one of the four states in which state revenue is the largest component of total K-12 revenue (left graph), and while it may be a bit difficult to eyeball the volatility graphs on the right, it is also one of the most volatile states as far as education spending, with a mean absolute year-to-year deviation (the average annual change without regard to whether it's positive or negative) of about 3.9 percent. This squares with the notion that greater reliance on (more volatile) state revenue may translate into more volatile education spending.

In Texas, although revenue is somewhat more evenly split between revenue from state and from local sources, at least during part of this time period, local revenue is clearly the largest share. And Texas, in contrast to California, exhibits among the more stable K-12 spending trends of any state during this time period (mean absolute year-to-year deviation of 2.4 percent), perhaps owing in part to its reliance on local property tax revenue, which is typically more stable during economic downturns (so much so that Texas' revenue remains stable despite its reliance on highly volatile severance taxes on gas and oil production).

Yet this relationship—larger state shares tend to be associated with more volatile funding—is far from universal. For instance, whereas Connecticut and

New Jersey maintain roughly similar revenue portfolios across this time period (around 60 percent local, 35 percent state), New Jersey's education spending, like California's, is among the most volatile in the nation (mean absolute year-to-year deviation of 3.6 percent) and Connecticut's among the most stable (2.3 percent). This may be due in part to the aforementioned fact that New Jersey targets more state aid to higher-poverty districts than does Connecticut in an effort to mitigate disparities and accommodate needs (i.e., volatility is more evenly distributed in Connecticut than in New Jersey). An unintended consequence may be that high-poverty New Jersey districts are more vulnerable than high-poverty Connecticut districts to economic downturns. In any case, this illustrates how other factors may confound the relationship between composition and volatility.

We now pivot to our regression analysis to present a more generalized view on how revenue composition is related to spending volatility. The models presented below more thoroughly explore the relationship between composition (i.e., state share) and volatility in two dimensions simultaneously: (1) within each state over time; and (2) across states, over all of the years involved. These are called “random effects” models. Note that this is a different approach from the adequacy and equity models discussed above, in which the two dimensions (between states and within states over time) were estimated as separate models—i.e., between and fixed effects models, respectively.

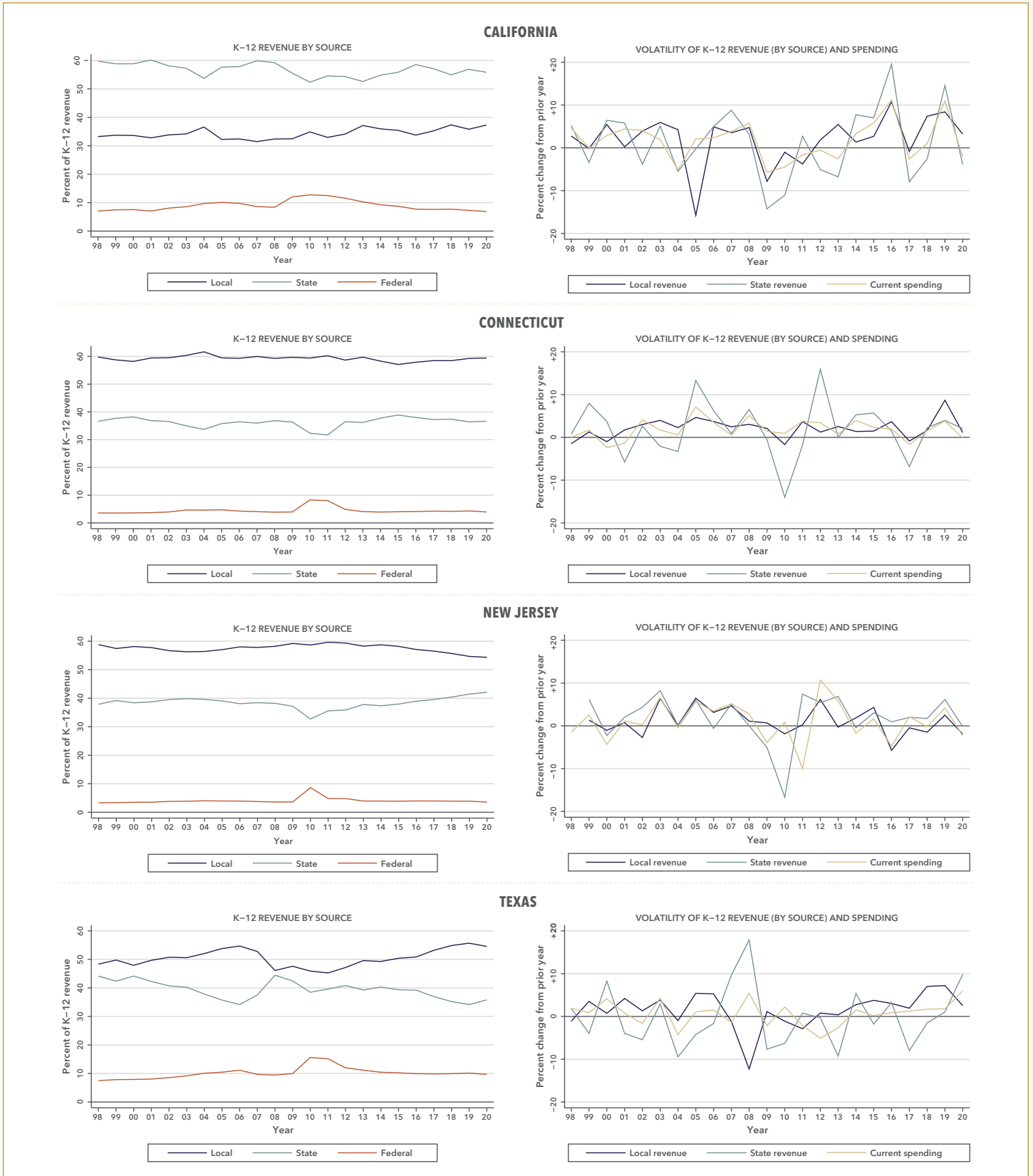
In other words, random effects models capture the composition/volatility association both between states (e.g., do states in which state revenue makes up a larger share of total K-12 revenue tend to exhibit greater spending volatility or stability?) as well as within states over time (i.e., when the state share of K-12 revenue increases over time within states, does spending volatility increase or decrease?). We choose these models (rather than BE and FE separately) because one of our volatility measures (TPVOL) involves averages for three time periods, rather than year-to-year changes, thus involving fewer changes over time within states (only two “transitions” between time periods).

In Table 7, we present the results from three random effects regression models, each of which explores the connections between revenue composition and one of the three measures of spending volatility discussed

FIGURE 9

K-12 revenue composition and revenue/spending volatility in four states, 1998-2020

Trend in the share of total K-12 revenue from local, state, and federal sources (left graphs) and year-to-year percentage changes in K-12 local revenue, state revenue, and current spending (right graphs), selected states, 1998-2020



Note: Revenue/spending estimates used to calculate year-to-year changes (right graphs) adjusted for regional variation in labor costs.

DATA SOURCE: U.S. CENSUS BUREAU



above and described in Table 2: absolute change (ABSCHG), time period volatility (TPVOL), and trend volatility (TRNDVOL). Like the adequacy and equity models above, these models include a control for the federal share of K-12 revenue. Unlike the adequacy and equity models, however, we also control here for Census poverty, which is averaged across

districts, within each state and year, weighted by enrollment. We control for poverty here, in part, as a set up to our next question, which is whether revenue composition has different effects in higher- versus lower-poverty settings. Yet we are also interested in testing whether revenue composition influences spending volatility while considering separately and

TABLE 7. MODELS OF K-12 SPENDING VOLATILITY ON K-12 REVENUE SOURCE (STATE SHARE)

Independent variable	Dependent variable (volatility measure)		
	Trend volatility (TRNDVOL)	Time period volatility (TPVOL)	Absolute change (ABSCHG)
State share of K-12 revenue	2.4806**	13.0009*	0.0030
	(1.1966)	(7.8174)	(0.0089)
Federal share of K-12 revenue	4.6831	38.8015	0.0757*
	(4.3586)	(26.2128)	(0.0401)
Statewide Census child poverty rate	-12.3271***	-18.5549	-0.0534*
	(3.2546)	(20.1817)	(0.0274)
Time period (baseline=pre-recession)			
K-12 recession	1.2138***	7.1019***	0.0045**
	(0.1687)	(0.9887)	(0.0018)
Post-recession	0.4516***	4.1926***	-0.0006
	(0.1660)	(0.9626)	(0.0018)
Constant	0.7828	-3.7459	0.0259***
	(0.7134)	(4.7905)	(0.0050)
Observations	966	966	966
Number of statefip	46	46	46

* p<0.10 ** p<0.05 *** p<0.01

Note: Results of random effects regressions of three measures of K-12 spending volatility on compositional and contextual variables (panel dataset of 1998-2020). See text (and Table 2) for more details on calculation of three volatility measures. Poverty variable is enrollment-weighted statewide average of district poverty rates among school-aged children (5-17 year olds) among districts included in our sample. Time periods defined as follows: pre-recession (1998-2006); K-12 recession (2007-2013); post-recession (2014-2020). All models exclude Alaska, the District of Columbia, Hawaii, Nevada, and Vermont. Standard errors in parentheses.

Data sources: U.S. Census Bureau; School Finance Indicators Database

concurrently whether volatility is associated with poverty. That is, does revenue composition influence spending volatility even controlling for state-level poverty levels?¹²

That said, the results of the three models presented in Table 7 evaluate how the “shifting sand” of revenue composition underlying current spending “affects” (or does not) the volatility of that spending. We’ll begin with the first two columns, which indicate that, as the share of revenue coming from the state increases, so too does the volatility relative to the mean of the time period (TPVOL) and the volatility around the trend (TRNDVOL), though the latter coefficient is only marginally significant.

As discussed above, these first two measures are normalized across states. That is, because they are proportional (standardized residuals relative to trend and standard deviation relative to mean) they are on the same scale across all states. A 1 percent increase in the share of revenue coming from the state is associated with a 0.025 standard deviation (2 percent of a standard deviation) increase in the volatility of spending around the trend, and a 13 percent change in the ratio of the standard deviation to the mean of year-over-year changes in spending, for the three periods (pre-recession, K-12 recession, and post-recession). It is difficult to determine how substantial these magnitudes of change are in terms of their disruptive influence on annual budget planning, but that is a question worthy of further exploration. Nonetheless, put simply, increasing the share of revenues coming from the state is associated with greater spending volatility when that volatility is standardized to a common scale across states.

In our third model (ABSCHG), volatility is measured as a percentage (absolute year-to-year change as percentage of total revenue), which is also comparable across states, but does not impose a normal distribution at any point in its construction. The coefficient for this model is also positive (indicating that volatility increases with state share), but the estimate is not statistically significant at any conventional level (i.e., there is too much variation for us to state with confidence that it’s “real”). That said, once again, given that our dataset includes (nearly) the full population

here, the positive coefficient—and its consistency with those of the other two models—is noteworthy.

DIFFERENCES IN STATE SHARE ESTIMATED “EFFECT” BY STATE-LEVEL POVERTY

Our final models test whether the association between composition and volatility/stability varies by state-level (Census) poverty. To review, the results presented in Table 7, above, suggest that states that rely more on state revenue tend to exhibit greater spending volatility. In addition, recall that higher-poverty districts tend to depend more on state revenue (i.e., a larger share of their total revenue comes from state sources). This means that, at least hypothetically, higher-poverty districts will tend to have more volatile spending than lower-poverty districts within a given state, all else being equal.

But there’s also the question of whether the association between state share and volatility—the rate at which volatility increases (or decreases) with the state revenue share—varies by state-level poverty. Put differently, is funding more volatile in higher-poverty states with a given state share compared with lower-poverty states with the same state share (between effects), and does an increase in poverty in a given state change the relationship between state share and volatility (fixed effects)?

The composition/volatility relationship may vary by state-level poverty, for example, because more affluent districts are often able (and willing) to make up for state revenue shortfalls with local property tax increases, and because those districts face smaller losses in state revenue to recover with local taxes. The ability to “smooth out” ebbs and flows in state revenue with local funds might serve to ease the vulnerability of districts to volatility, but only if those districts have the means (i.e., wealth) to provide such funding. And, in general, poorer states may have fewer districts with such capacity (or they may be more or less likely to grant districts that flexibility).

So, our goal here is to evaluate statistically whether we actually do see a pattern wherein the influence of revenue composition on spending volatility changes as poverty increases (or decreases). One simple

¹² We did not include a control variable for poverty in the adequacy and equity models because poverty was a major factor determining the district-level cost estimates used to construct our adequacy and equity outcome measures. In other words, poverty was already “baked in” to these outcomes, with higher-poverty states exhibiting higher estimated costs.

way to do so is to fit an “interaction” between state share and poverty, which essentially tests whether statewide poverty “speeds up” or “slows down” the estimated effect of state share on volatility. The vol-

atility models presented in Table 8 are the same as those in Table 7, except the former include such an interaction term.

TABLE 8. MODELS OF K-12 SPENDING VOLATILITY ON K-12 REVENUE SOURCE (STATE SHARE) WITH INTERACTION

Independent variable	Dependent variable (volatility measure)		
	Trend volatility (TRNDVOL)	Time period volatility (TPVOL)	Absolute change (ABSCHG)
State share X poverty	4.2787 (19.0332)	62.3086 (116.7913)	0.3893** (0.1625)
State share of K-12 revenue	1.8380 (3.1291)	3.6917 (19.0461)	-0.0584** (0.0271)
Statewide Census child poverty rate	-14.5545 (10.2976)	-50.4823 (63.2381)	-0.2522*** (0.0873)
Federal share of K-12 revenue	4.7486 (4.3716)	39.8622 (26.3251)	0.0775* (0.0399)
Time period (baseline=pre-recession)			
K-12 recession	1.2179*** (0.1694)	7.1449*** (0.9928)	0.0048*** (0.0018)
Post-recession	0.4565*** (0.1671)	4.2539*** (0.9701)	-0.0002 (0.0018)
Constant	1.1054 (1.6018)	0.8457 (9.8186)	0.0565*** (0.0137)
Observations	966	966	966
Number of states	46	46	46

* p<0.10 ** p<0.05 *** p<0.01

Note: Results of random effects regressions of three measures of K-12 spending volatility on compositional and contextual variables (panel dataset of 1998-2020). See text (and Table 2) for more details on calculation of three volatility measures. Poverty variable is enrollment-weighted statewide average of district poverty rates among school-age children (5- to 17-year-olds) among districts included in our sample. Time periods defined as follows: pre-recession (1998-2006); K-12 recession (2007-2013); post-recession (2014-2020). All models exclude Alaska, the District of Columbia, Hawaii, Nevada, and Vermont. Standard errors in parentheses.

Data sources: U.S. Census Bureau; School Finance Indicators Database

In short, we find some evidence of this interactivity. The interaction term is positive in all three models (higher state shares “increase” volatility more in higher-poverty states), but only statistically significant at any conventional level in the ABSCHG model (where, by the way, the direct effect of state share on

volatility flips to negative). Note also that the three direct (noninteractive) poverty coefficients are negative (volatility increases with state-level poverty), and, again, only significant in the ABSCHG model. The implication is that volatility is lower where poverty is higher or increasing (average of both).

DISCUSSION

As noted above, the limitations of our data and models, as well as the complexity and heterogeneity of state school finance systems, preclude our drawing conclusions about the *causal* effect of K-12 revenue composition on adequacy, equity, or volatility. We would, however, argue that our findings offer some important insight into these relationships, which in turn can help to guide policymakers toward better school funding systems.

In our models exploring the association between composition (i.e., state share of revenue) and state-wide adequacy, we find some evidence that when the state share of revenue increases over time (within states), funding becomes more adequate. However, despite this longitudinal relationship, states that are more reliant on state revenue do not exhibit more widespread adequacy (and, indeed, the coefficients, while not statistically significant at any conventional level, suggest that adequacy declines with state share).

Our results on the connection between composition and equity (or equal opportunity, defined as the gap in adequacy between the highest- and lowest-poverty districts in each state) are somewhat more consistent. Specifically, we find that states with higher state shares also tend to exhibit more equitable K-12 funding. In addition, increases in the state share are positively associated with increases in equity, but the latter estimates are not significant at any conventional level.

We interpret the results of both sets of models as tentative evidence of the potential adequacy and equity benefits of ensuring that a healthy share of K-12 funding comes from state sources (typically income and sales taxes). This does not, of course, mean that the higher the state share the better, not only because of our findings on volatility, but also because local property tax revenue is an important component of

K-12 funding. But state revenue, unlike local revenue, is typically pooled and targeted according to district need and capacity, and maintaining a large enough pool is an important part of good K-12 finance systems, particularly in states where needs and capacity vary widely across districts.

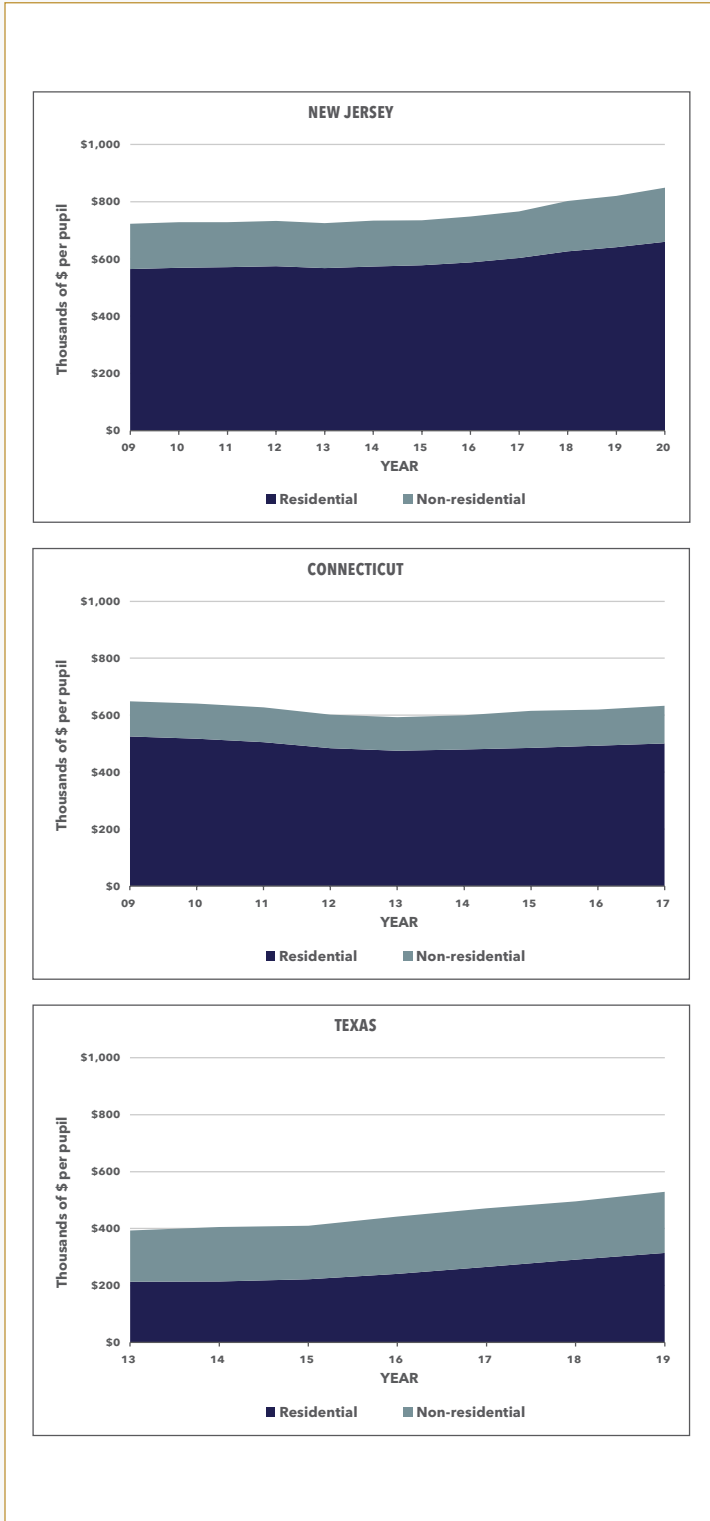
In contrast, however, in both the models of adequacy and equity, we find little consistent or compelling evidence that the share of total state and local revenue from individual income taxes is associated with improvements in either K-12 funding outcome.

Finally, our models focused on the connection between composition and spending volatility/stability suggest there is a rather consistent association between state share and volatility, specifically that greater reliance on state revenue (versus local revenue) is associated with more volatility of K-12 funding. This, we suggest, is because the taxes that constitute most state revenue (those on income and sales, particularly the former) are more volatile than the property taxes that feed local coffers. We also find only weak evidence that this relationship varies by poverty—i.e., that the volatility-increasing “effect” of larger state revenue shares is more pronounced in higher-poverty states compared with lower-poverty states.

In summary, then, our results indicate that greater reliance on state revenue as a share of total K-12 revenue may represent a trade-off—i.e., it may improve adequacy and equity but foster greater volatility of resources over time (and all the hardships that such volatility entails). Yet, it is very important to reiterate that these relationships are less a result of any inherent features of different taxes than they are of how taxes are generally collected and how they flow to districts and schools. There is, hypothetically, no reason why states couldn’t tax property (some or all) and distribute revenues according to district need

FIGURE 10
Trend in property tax base composition in three states

Trend in residential and non-residential taxable property wealth per pupil, selected states, 2009-2020 (period varies by state)



Note: Property wealth values expressed in thousands of dollars per pupil. Time period represented in the graphs varies by state due to data availability.

DATA SOURCE: CONNECTICUT OFFICE OF POLICY AND MANAGEMENT; NEW JERSEY DEPARTMENT OF COMMUNITY AFFAIRS; TEXAS COMPTROLLER



and capacity, just as there is nothing stopping most income and sales taxes from being collected locally (and distributed in a highly inequitable manner), as they are in some cases already.

The point here is not to interpret the potential connection between composition and these K-12 funding outcomes as an invitation to turn taxation and school finance on its head by reversing fundamental features of systems that have developed over many decades. The idea, rather, is that composition matters and should be part of the conversation, that proposals to eliminate local property tax revenue as a source of school funding may be overlooking an important unintended side effect, and also that there may be unconventional but still realistic approaches to revenue composition-focused reform that exploit this trade-off between adequacy/equity and volatility. And one of these approaches, which is discussed above, is state taxation of nonresidential (e.g., commercial and industrial) property. It might therefore be useful to offer some additional discussion and descriptive results pertaining to this idea, as it seems to flow so neatly from our results.

PROPERTY TAX BASE DECOMPOSITION FOR SELECT STATES

To reiterate from above, the benefit of state taxation of commercial/industrial property, put simply, is that such taxes would (like residential property taxes) be relatively stable, but they would also, if collected by states and distributed like most state revenue, be potentially beneficial for adequacy and equity.

That taxable nonresidential properties such as commercial and industrial properties tend to be about as stable as residential property values is illustrated in Figure 10, which presents the total property tax base (total taxable property wealth) per pupil, separated by residential/nonresidential, using actual data from Connecticut (Connecticut OPM 2022), New Jersey (New Jersey DCA 2022), and Texas (Texas Comptroller 2021). three states for which such data are available (these are also three of the four states for which we examined descriptive volatility results in Figure 9). The breakdown of taxable property wealth into its nonresidential versus residential portions varies across these three states but it is a significant proportion in all three. In Northeastern states such as Connecticut and New Jersey, nonresidential property

values make up about 20 percent of the tax base, whereas in Texas about 40 percent of taxable property wealth is nonresidential. We do not have this type of data for most other states, but we are confident that their distributions are somewhere in the range of 20-40 percent.

The implication here is that, at common tax rates on residential and nonresidential properties, redistributing revenues from taxes on nonresidential properties could redistribute 20-40 percent of property tax revenue, not a trivial share of total state and local revenue to say the least. Figure 11 provides a hypothetical illustration what might be accomplished by “reshuffling” revenues by tax source from the typical average distribution to a (re)distribution that might be possible in New Jersey or Connecticut (where 20 percent of property wealth is nonresidential), or to an even larger extent in a state such as Texas (40 percent).

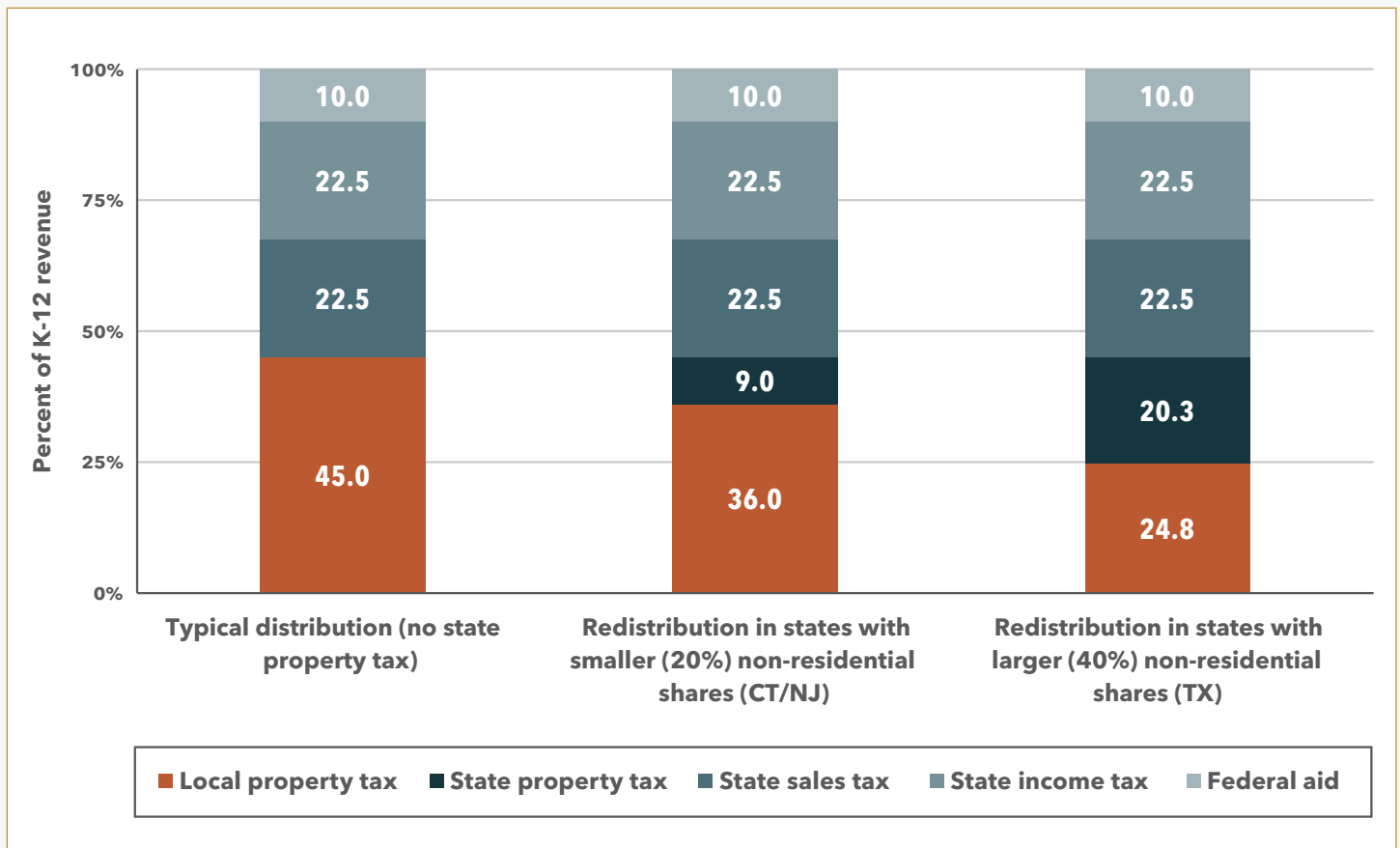
On average, across all states (represented by the left bar), about 45 percent of school revenue comes from

state sources, about 45 percent from local sources (mainly property tax), and the remaining 10 percent or so in the form of federal aid (these are rounded approximations). Within the 45 percent of state revenue, let’s assume about a 50/50 split: about 22.5 percent derived from volatile income taxes and the other 22.5 from sales taxes, which are also volatile but less so than those on income. And the remaining 45 percent (local revenue, mostly property tax) is stable but inequitable (i.e., more affluent districts receive more). We assume in this visual presentation, for simplicity, that the entirety of current local revenue is from taxation of residential and nonresidential property. The shaded teal portions of the bar are equitably distributed shares (55 percent in the typical distribution scenario) whereas the orange portion is the inequitably distributed share (45 percent).

Now suppose we shift the commercial/industrial tax base to statewide taxation (and targeted redistribution) at the same average rate as is applied locally. In a situation (the middle bar in Figure 11) where 20

FIGURE 11

Hypothetical rebalancing of K-12 revenue portfolio



percent of taxable property wealth is commercial/industrial, as in California and New Jersey, this means we could shift 9 percent of total revenues toward improving adequacy/equity while also maintaining that share's stability, leaving only 36 percent of revenues to be raised inequitably—i.e., locally, from local taxes on residential properties alone. And, in a state

such as Texas, where 40 percent of the property tax base is nonresidential, we could potentially move a much larger share of stable revenues to the statewide pool (20.3 percent), and, conversely, create a more substantial reduction in the share of revenues that are distributed (and raised) inequitably (from 45 to 25 percent).

TABLE 9. HYPOTHETICAL REDISTRIBUTION OF K-12 REVENUE PORTFOLIO IN THREE STATES

State	Revenue source	Original	Redistributed
Connecticut	Local property tax	59.43	47.01
	State property tax		12.42
	State aid	36.64	36.64
	Federal aid	3.95	3.95
New Jersey	Local property tax	54.34	42.28
	State property tax		12.06
	State aid	42.09	42.09
	Federal aid	3.57	3.57
Texas	Local property tax	54.55	32.40
	State property tax		22.15
	State aid	35.80	35.80
	Federal aid	9.66	9.66

Note: Estimates in “redistributed” column represent a hypothetical illustration of how state taxation of nonresidential property in each state might affect existing distributions of school funding by source/type. Each “state property tax” row is the (hypothetical) percentage of total funding that might result from state nonresidential property taxes, with estimates based on the percentage of each state’s taxable property wealth that is classified as nonresidential in the most recent available year of data (see Figure 10).

Data sources: U.S. Census Bureau; Connecticut Office of Policy and Management; New Jersey Department of Community Affairs; Texas Comptroller

Table 9 reframes the hypothetical breakdown in Figure 11, using actual data from Connecticut (Connecticut OPM 2022), New Jersey (New Jersey DCA 2022), and Texas (Texas Comptroller 2021). We are once again assuming, for the sake of this illustration, that local revenues are entirely derived from property taxes. The percentages in the “original” column are actual distributions of K-12 revenue by source (from the U.S. Census), whereas the “redistributed” column, like the two rightmost bars in Figure 11, represent the potential impact of state taxation of nonresidential property.

Table 9 suggests that the share of revenue raised inequitably across localities in Texas (i.e., the local property tax proportion) could be reduced from 55 to 32 percent while simultaneously boosting the share of aid that is distributed equitably (the sum of shares from state property tax, state aid, and federal aid) from 45 to 68 percent. The (illustrative) effects are less dramatic but still substantial in Connecticut and New Jersey, two states in which highly unequal local revenues complicate the task of offsetting those inequalities with state aid. The share of revenue raised inequitably (locally) is reduced by over 10 percentage points in both states, with that share shifted toward availability for (equitable) redistribution through the state aid formula.

POLICY RECOMMENDATIONS

The primary job of state school finance systems is to provide all students, regardless of their backgrounds, with the resources they need to achieve common outcome goals. Within this framework, how much states and districts spend has rightfully received a great deal of attention. In this report, we have examined the role of a far less frequently acknowledged but potentially important factor: the *composition* of revenue. In other words, not how much funding, but where it comes from.

Composition may matter because different types and sources of revenue tend to be distributed differently to schools, and to respond differently to economic conditions. To be perfectly clear, state revenue, because it is typically targeted (albeit often imperfectly) by district need and capacity, is a crucial equalizer in state finance systems. At the same time, however, our results suggest that while greater reliance on state over local revenue may contribute to greater adequacy and equity of K-12 spending, it is also important to weigh this benefit against the cost of greater volatility over time.

Our first and most general recommendation, therefore, is for **states to maintain at least a somewhat balanced portfolio of revenues by source to support public elementary and secondary education**, inclusive of income taxes (individual and corporate), sales taxes (on goods and services), and property taxes (on residential, commercial, industrial, and other properties). We are not able to provide specific guidance regarding the optimal shares of state versus local revenue, and such optimal shares, even if they were feasible to calculate, would vary by state (e.g., according to needs, existing distribution formulas, economic conditions, etc.). We can, however, recommend generally that states maintain a substantial share of revenue from local sources (approximately 30-35 percent or greater). The state share of revenue should in most states be the dominant share, but local revenue can provide protection against volatility and its consequences.

On a related note, states should seriously consider rolling back or eliminating policies that cap or otherwise constrain state and/or local revenue growth, as these policies can limit the ability to balance revenue

portfolios. This is particularly important in the case of caps on local property tax revenue (e.g., Colorado's TABOR, or Proposition 13 in California), since flexibility in raising local revenue can also allow districts, particularly middle-income/wealth districts, to offset some of the volatility of state revenue with local tax increases during recessions and downturns.

At the very least, our findings also lend themselves to implications as to what *not* to do—i.e., we would caution against any attempt to *entirely* replace local revenue with state revenue (or vice versa) without a careful examination of its implications, which in the local-for-state shift would be increased volatility. Proposals to replace property taxes entirely with state income and sales taxes, while typically well-meaning and correct in their focus on equity, may be addressing a problem (inequity) but exacerbating another (volatility) that is also of particular concern to poorer districts.

Higher-poverty districts must, to be clear, rely very heavily on state revenue (given their higher costs and constrained ability to raise local revenue), but complete or near complete reliance may shoulder these districts, which already face substantial challenges (e.g., recruiting and retaining teachers), with even more trouble in the year-to-year budgeting process, and could put them in an even more catastrophic situation when state aid dries up during economic downturns. In addition, to the degree middle- and lower-income districts have the capacity to pay their own "fair share" in local revenue, they should do so. Local revenue, even if it does not constitute a majority of revenue, can have outsized benefits in terms of stability.

And it also bears mentioning that any proposals to require a balanced *federal* budget would subject the relatively small but important federal portion of total K-12 revenue (and that going to many other services) to the same volatility as that of state revenue, and also severely limit the ability of federal aid to help fill budget gaps during recessions and downturns.

Recommending states balance their revenue portfolios is one thing, but actually accomplishing this goal is complicated (even putting aside the fact that

few policy areas are as politically arduous as taxes). Concrete recommendations of beneficial approaches to balance revenue portfolios are somewhat elusive precisely because there is a trade-off between adequacy/equity and stability. Suppose, for instance, a state that relied extremely heavily on local revenue wanted to boost adequacy/equity by increasing its state share. The most direct way to accomplish this without a harmful reduction in total funding (i.e., by reducing local revenue) is to increase state revenue. This might entail a cost of greater volatility, and it might be worth paying that cost if justified by the increase in adequacy/equity. Ideal policies, however, are those that, in a sense, exploit the trade-off between adequacy/equity and stability “within revenue type/source” (changing what is taxed and who collects it) rather than “between type/source” (directly replacing one tax source or type with another).

We therefore recommend that states **consider policies to redistribute stability (e.g., state taxation of commercial/industrial property) and/or stabilize redistribution (e.g., expanding the state sales tax base in a progressive or progressivity-neutral manner)**. The key here is not changing the type of taxes levied but rather who collects them or what is taxed.

The idea of state taxation of commercial/industrial property has existed in the academic literature for over 40 years but has never really been tried at scale. The results of our adequacy/equity and volatility models, as well as our supplemental analysis of the property tax bases in California, Connecticut, and Texas, suggest that these policies, coupled with state aid formulas designed specifically to advance adequacy and equal opportunity, could have a substantial impact on the stability and equitability of K-12 funding in many states. It is also entirely plausible, at least in theory, that some portion of *residential* property be subject to state taxation and subsequently contributed to the state general fund for equitable distribution to districts (for example, splitting the residential tax base between land and structures, and imposing state property taxes on the former).

Although this sort of proposal constitutes a major change in state tax policy, one that in some states might require a constitutional amendment permitting state taxation of property, it is generally a “win-win-win” on equity, equal opportunity and equalizing volatility. Yet it also depends on funding

formulas that do a good job of targeting revenue by district need and capacity. Without equitable distribution formulas—without the deliberate targeting of funding at the districts that need it most—the benefits of state taxation of nonresidential property are consumed by the loss of local property tax revenue.

One additional idea that is not discussed above, but also maintains the balance of tax revenue both by type and also (potentially) by source, focuses instead on changing the tax base: It is for states to rely more heavily on progressive sales taxes (or, more realistically, to expand the sales tax base in a “progressivity-neutral” manner). The idea of this approach is that it would exploit the trade-off between adequacy/equity and stability by: (1) shifting state revenue from income to sales taxes, as the latter are more stable but still distributed as equitably (via the general statewide pool); but also (2) maintaining the overall progressivity of state taxation for taxpayers.

As mentioned above, sales taxes, unlike income taxes, are generally regressive—i.e., lower-income families pay a larger share of their income in sales taxes than do higher-income families (Wiehe et al. 2018). This is because sales tax rates do not typically vary by income (as is the case with income taxes, in which case higher earners pay a higher rate), and most of the things upon which states (and localities) levy sales taxes are retail goods on which lower earners spend more of their income than do their higher earner counterparts (though most states do tax at least some services, and make exempt from sales tax important “essential” goods such as food). Yet there are dozens of types of services that are not typically subject to sales tax and, if they were, could yield substantial revenue for schools and other public services (Mazerov 2009).

The problem is that this expansion of the sales tax base alone, in order to maintain the overall progressivity of state taxes (remember that we’re talking about replacing income with sales taxes), would have to be so narrow as to severely constrain the additional revenue it would produce (e.g., it would have to be limited to taxes on services overwhelmingly used by higher earners, such as investment counselors and country club memberships). Now, to be clear, even this limited expansion would be helpful, but ideally we’d like a broader expansion of the sales tax base (e.g., taxes on haircuts, laundry, etc.), as it

would improve the stability of state revenue. Such an expansion, however, coupled with a reduction in income taxes, would almost certainly make state taxation more regressive (Mazerov 2009).

(Note that, in theory, maintaining the progressivity of state taxation is not an absolute requirement here—heavier reliance on regressive sales taxes versus income taxes would have the same effect on stability—but we would argue forcefully that the cost in terms of more regressivity would not come close to being justified by the stability benefits.)

We are mindful that state and local taxation and school finance systems have developed over many decades, and the composition of K-12 revenue is in many respects something that “just happens” rather than an outcome that is planned directly. We also acknowledge that even small changes to these systems often require massive efforts on the part of legislators, advocates, parents, educators, and other stakeholders.

That said, the most general implication of our findings is that they suggest that revenue composition

Yet the wider expansion of the sales tax base could be feasible from a progressivity standpoint were it, for example, coupled with income tax credits targeted at low-income households, including non-earned income tax credits for taxpayers who are retired, disabled, or otherwise unable to earn. In other words, states could expand their sales tax bases but offset the regressive impact of that change by making income taxes even more progressive.

may be an important factor mediating the outcomes of states’ school finance systems, and it deserves more attention in our debate about the performance of these systems and how to improve them. Two states with identical finance systems and student populations, and which spend the same amount overall on K-12 schools, might have very different adequacy/equity and stability outcomes depending on the composition of their revenue. Where money comes from matters too, and it’s a feature that could potentially be leveraged to produce better school funding systems.

REFERENCES

- Addonizio, Michael F., C. Philip Kearney, and Henry J. Prince. 1995. "Michigan's High Wire Act." *Journal of Education Finance* 20(3):235–69.
- Baker, Bruce D. 2016. *Review of "School Spending and Student Achievement in Michigan: What's the Relationship?"* Boulder, CO: National Education Policy Center.
- Baker, Bruce D. 2017. *How Money Matters for Schools*. Palo Alto, CA: Learning Policy Institute.
- Baker, Bruce D. 2018. *Educational Inequality and School Finance: Why Money Matters for America's Students*. Cambridge, MA: Harvard University Press.
- Baker, Bruce D., and Matthew Di Carlo. 2020. *The Coronavirus Pandemic and K-12 Education Funding*. Washington, D.C.: Albert Shanker Institute.
- Baker, Bruce D., Matthew Di Carlo, and Mark Weber. 2022. *The Adequacy and Fairness of State School Finance Systems (Fifth Edition)*. Washington, D.C.: Albert Shanker Institute.
- Baker, Bruce D., Matthew Di Carlo, Mark Weber, and Ajay Srikanth. 2022a. *School Finance Indicators Database: District Cost Database (2nd Release)*. Washington, D.C.: Albert Shanker Institute.
- Baker, Bruce D., Matthew Di Carlo, Mark Weber, and Ajay Srikanth. 2022b. *School Finance Indicators Database: State Indicators Database (5th Release)*. Washington, D.C.: Albert Shanker Institute.
- Baker, Bruce D., and Sean P. Corcoran. 2012. *The Stealth Inequalities of School Funding: How State and Local School Finance Systems Perpetuate Inequitable Student Spending*. Washington, D.C.: Center for American Progress.
- Baker, Bruce D., Mark Weber, and Ajay Srikanth. 2021. "Informing Federal School Finance Policy with Empirical Evidence." *Journal of Education Finance* 47(1):1–25.
- Brazer, Harvey E. 1961. "The Value of Industrial Property as a Subject of Taxation." *Canadian Public Administration* 4(2):137–47.
- Brent, Brian O. 1999. "An Analysis of the Influence of Regional Nonresidential Expanded Tax Base Approaches to School Finance on Measures of Student and Taxpayer Equity." *Journal of Education Finance* 24(3):353–78.
- Cabral, Marika, and Caroline Hoxby. 2012. "The Hated Property Tax: Salience, Tax Rates, and Tax Revolts." *National Bureau of Economic Research Working Paper Series* No. 18514.
- Candelaria, Christopher A., and Kenneth A. Shores. 2019. "Court-Ordered Finance Reforms in the Adequacy Era: Heterogeneous Causal Effects and Sensitivity." *Education Finance and Policy* 14(1):31–60.
- Chapman, Jeffrey I. 2008. "State and Local Fiscal Sustainability: The Challenges." *Public Administration Review* 68:S115–31.
- Connecticut OPM. 2022. *Municipal Fiscal Indicators (Dataset)*. Hartford, CT: State of Connecticut Office of Policy and Management, Office of Finance, Municipal Finance Services Unit.
- Cornia, Gary, and Ray Nelson. 2010. "State Tax Revenue Growth and Volatility." *Regional Economic Development* 23–58.
- Cornman, Stephen Q., Laura C. Nixon, Matthew J. Spence, Lori L. Taylor, and Douglas E. Geverdt. 2019. *Education Demographic and Geographic Estimates (EDGE) Program American Community Survey Comparable Wage Index for Teachers (ACS-CWIFT) (NCES 2018-130)*. Washington, D.C.: National Center for Education Statistics.
- Cornman, Stephen Q., J. J. Phillips, M. R. Howell, and Longjun Zhou. 2022. *Revenues and Expenditures for Public Elementary and Secondary Education: FY 20 (NCES 2022-301)*. Washington, DC: National Center for Education Statistics.
- Craft, Matthew M. 2002. "LOST and Found: The Unequal Distribution of Local Option Sales Tax Revenue Among Iowa Schools." *Iowa Law Review* 88.
- Downes, Thomas A., and David N. Figlio. 2007. "Tax and Expenditure Limits, School Finance and School Quality." Pp. 395–410 in *Handbook of Research in Education Finance and Policy (first edition)*, edited by H. F. Ladd and E. Fiske. New York: Routledge.
- Duncombe, William, and John Yinger. 1998. "School Finance Reform: Aid Formulas and Equity Objectives." *National Tax Journal* 51(2):239–62.

- Duncombe, William, and John Yinger. 2000. "Financing Higher Student Performance Standards: The Case of New York State." *Economics of Education Review* 19(4):363–86.
- Duncombe, William, and John Yinger. 2005. "How Much More Does a Disadvantaged Student Cost?" *Economics of Education Review* 24(5):513–32.
- Dynarski, Susan, Joshua Hyman, and Diane Whitmore Schanzenbach. 2013. "Experimental Evidence on the Effect of Childhood Investments on Postsecondary Attainment and Degree Completion." *Journal of Policy Analysis and Management* 32(4):692–717.
- Figlio, David N. 1998. "Short-Term Effects of a 1990s-Era Property Tax Limit: Panel Evidence on Oregon's Measure 5." *National Tax Journal* 51(1):55–70.
- Figlio, David N., and Kim S. Rueben. 2001. "Tax Limits and the Qualifications of New Teachers." *Journal of Public Economics* 80(1):49–71.
- Fritts, Janelle. 2022. "Where Do People Pay the Most in Property Taxes?" *Tax Foundation*. Retrieved (<https://taxfoundation.org/property-taxes-by-state-county-2022/>).
- Garrett, Thomas A. 2009. "Evaluating State Tax Revenue Variability: A Portfolio Approach." *Applied Economics Letters* 16(3):243–46.
- Geverdt, Doug. 2018. *Education Demographic and Geographic Estimates Program (EDGE): School Neighborhood Poverty Estimates - Documentation (NCES 2018-027)*. Washington, D.C.: National Center for Education Statistics.
- Gordon, Nora. 2004. "Do Federal Grants Boost School Spending? Evidence from Title I." *Journal of Public Economics* 88(9):1771–92.
- Hanushek, Eric A., John F. Kain, and Steven G. Rivkin. 2004. "Why Public Schools Lose Teachers." *The Journal of Human Resources* 39(2):326–54.
- Imazeki, Jennifer, and Andrew Reschovsky. 2004. "Is No Child Left Behind an Un (or Under) Funded Federal Mandate? Evidence from Texas." *National Tax Journal* 57(3):571–88.
- Jackson, C. Kirabo. 2020. "Does School Spending Matter? The New Literature on an Old Question." Pp. 165–86 in *Confronting Inequality: How Policies and Practices Shape Children's Opportunities*, edited by L. Tach, R. Dunifon, and D. L. Miller. Cambridge, MA: National Bureau of Economic Research.
- Jackson, C. Kirabo, Rucker C. Johnson, and Claudia Persico. 2016. "The Effects of School Spending on Educational and Economic Outcomes: Evidence from School Finance Reforms *." *The Quarterly Journal of Economics* 131(1):157–218.
- Jackson, C. Kirabo, and Claire Mackevicius. 2023. "What Impacts Can We Expect from School Spending Policy? Evidence from Evaluations in the U.S." *American Economic Journal: Applied Economics* 2.
- Jackson, C. Kirabo, Cora Wigger, and Heyu Xiong. 2021. "Do School Spending Cuts Matter? Evidence from the Great Recession." *American Economic Journal: Economic Policy* 13(2):304–35.
- Kenyon, Daphne A., Bethany Paquin, and Andrew Reschovsky. 2022. *Rethinking the Property Tax-School Funding Dilemma*. Cambridge, MA: Lincoln Institute of Land Policy.
- Konstantopoulos, Spyros, and Vicki Chung. 2009. "What Are the Long-Term Effects of Small Classes on the Achievement Gap? Evidence from the Lasting Benefits Study." *American Journal of Education* 116(1):125–54.
- Ladd, Helen F. 1976. "State-Wide Taxation of Commercial and Industrial Property for Education." *National Tax Journal* 29(2):143–53.
- Ladd, Helen F., and Edward W. Harris. 1995. "Statewide Taxation of Nonresidential Property for Education." *Journal of Education Finance* 21(1):103–22.
- Lafortune, Julien, Jesse Rothstein, and Diane Whitmore Schanzenbach. 2018. "School Finance Reform and the Distribution of Student Achievement." *American Economic Journal: Applied Economics* 10(2):1–26.
- Lankford, Hamilton, Susanna Loeb, and James Wyckoff. 2002. "Teacher Sorting and the Plight of Urban Schools: A Descriptive Analysis." *Educational Evaluation and Policy Analysis* 24(1):37–62.

- Leachman, Michael, Kathleen Masterson, and Eric Figueroa. 2017. *A Punishing Decade for School Funding*. Washington, D.C.: Center on Budget and Policy Priorities.
- Liu, Edward, and Susan Moore Johnson. 2006. "New Teachers' Experiences of Hiring: Late, Rushed, and Information-Poor." *Educational Administration Quarterly* 42(3):324–60.
- Mazerov, Michael. 2009. *Expanding Sales Taxation of Services: Options and Issues*. Washington, DC: Center on Budget and Policy Priorities.
- McNichol, Elizabeth. 2013. *Strategies to Address the State Tax Volatility Problem: Eliminating the State Income Tax Not a Solution*. Washington, D.C.: Center on Budget and Policy Priorities.
- Moser, Michele, and Ross Rubenstein. 2002. "The Equality of Public School District Funding in the United States: A National Status Report." *Public Administration Review* 62(1):63–72.
- NASBO. 2022. *Fiscal Survey of States - Spring 2022*. Washington, D.C.: National Association of State Budget Officers.
- National Center for Education Statistics. 2022. *National Assessment of Educational Progress (NAEP), 2020 and 2022 Long-Term Trend (LTT) Reading and Mathematics Assessments*. Washington, D.C.: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics.
- New Jersey DCA. 2022. *Property Tax Information (Dataset)*. Trenton, NJ: State of New Jersey Department of Community Affairs.
- Reardon, Sean F., Andrew D. Ho, Benjamin R. Shear, Erin M. Fahle, Demetra Kalogrides, Heewon Jang, and Belen Chavez. 2021. *Stanford Education Data Archive (Version 4.1)*. Palo Alto, CA: Stanford University.
- Rebell, Michael A. 2009. *Courts and Kids: Pursuing Educational Equity through the State Courts*. Chicago, IL: University of Chicago Press.
- Reschovsky, Andrew, and Jennifer Imazeki. 2000. "Achieving Educational Adequacy through School Finance Reform." *Journal of Education Finance* 26:373–96.
- Seegert, Nathan. 2016. "Tax Revenue Volatility: Evidence from US States." *SSRN Electronic Journal*.
- Sorensen, Lucy C., and Helen F. Ladd. 2020. "The Hidden Costs of Teacher Turnover." *AERA Open* 6(1):2332858420905812.
- Tannenwald, Robert. 2002. "Are State and Local Revenue Systems Becoming Obsolete?" *National Tax Journal* 55(3):467–89.
- Taylor, Lori L. 2014. *Extending the NCES Comparable Wage Index*. College Station, TX: Texas A&M University.
- Taylor, Lori L., William J. Fowler, and Mark Schneider. 2006. *A Comparable Wage Approach to Geographic Cost Adjustment (NCES 2006-321)*. Washington, D.C.
- Texas Comptroller. 2021. *School District Property Value Study (Government Code Section 403.302): 2020 Final Findings (Dataset)*. Austin, TX: Texas Comptroller.
- U.S. Census Bureau. 2022a. *Annual Survey of School System Finances: Public Elementary-Secondary Education Finance Data (Dataset)*. Washington, D.C.: U.S. Census Bureau.
- U.S. Census Bureau. 2022b. *Annual Survey of State and Local Government Finances (Dataset)*. Washington, DC: U.S. Department of Commerce, Bureau of the Census.
- Wiehe, Meg, Aidan Davis, Carl Davis, Matt Gardner, Lisa Christensen Gee, and Dylan Grundman. 2018. *Who Pays? A Distributional Analysis of the Tax Systems in All 50 States (Sixth Edition)*. Washington, DC: The Institute on Taxation and Economic Policy.

